THE LANES PENWORTHAM

The Lanes, Penwortham – Transport Assessment

July 2021

Taylor Wimpey

Homes England

REPORT

Taylor Wimpey UK Ltd and Homes England

Proposed Residential Development, The Lanes, Penwortham

July 2021

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Transport Assessment

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1 Introduction

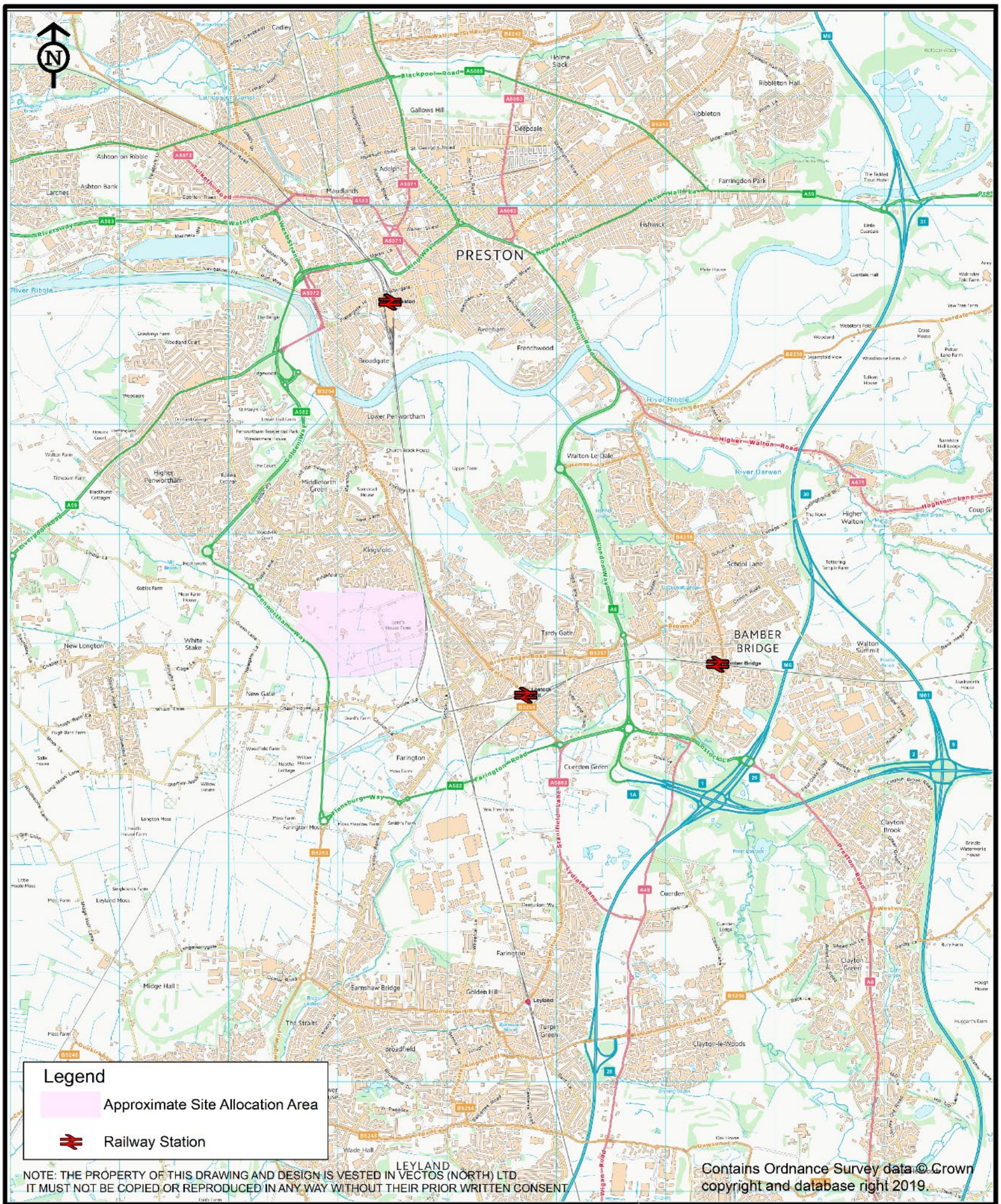
Background

1.1 Vectos has been instructed by Taylor Wimpey and Homes England to provide transport and mobility advice in relation to a proposed residential-led mixed-use development on land to the east of Penwortham Way. The proposed development is located within the administrative authority of South Ribble Borough Council (SRBC) with Lancashire County Council (LCC) the Local Highway Authority.

1.2 The proposed development is actually part of a wider site allocation within the South Ribble Local Plan, known locally as Pickering's Farm. The Local Plan envisages up to 1,350 residential dwellings being provided on the site allocation within the Plan period, with associated necessary infrastructure.

1.3 The proposed development (and site allocation) is located to the south of Penwortham. It is bound by Penwortham Way to the west, existing residential development to the north, the West Coast Mainline railway to the east and agricultural fields to the south (which is also safeguarded land in the Local Plan). It comprises a mix of land uses including agricultural land (separated into a number of fields by fences, hedgerows and trees), a pylon corridor and a network of adopted roads and public rights of way (PRoW). There are also a number of individual residential properties in private ownership which are accessed via Bee Lane, Flag Lane, Lord's Lane, Moss Lane and Nib Lane.

1.4 The site allocation location in the wider context is shown in **Figure 1.1**, with **Figure 1.2** presenting a more local context.



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DRAWING TITLE:
Site Location (Wider Context)

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Figure 1.1: Site Allocation Location (Wider Context)

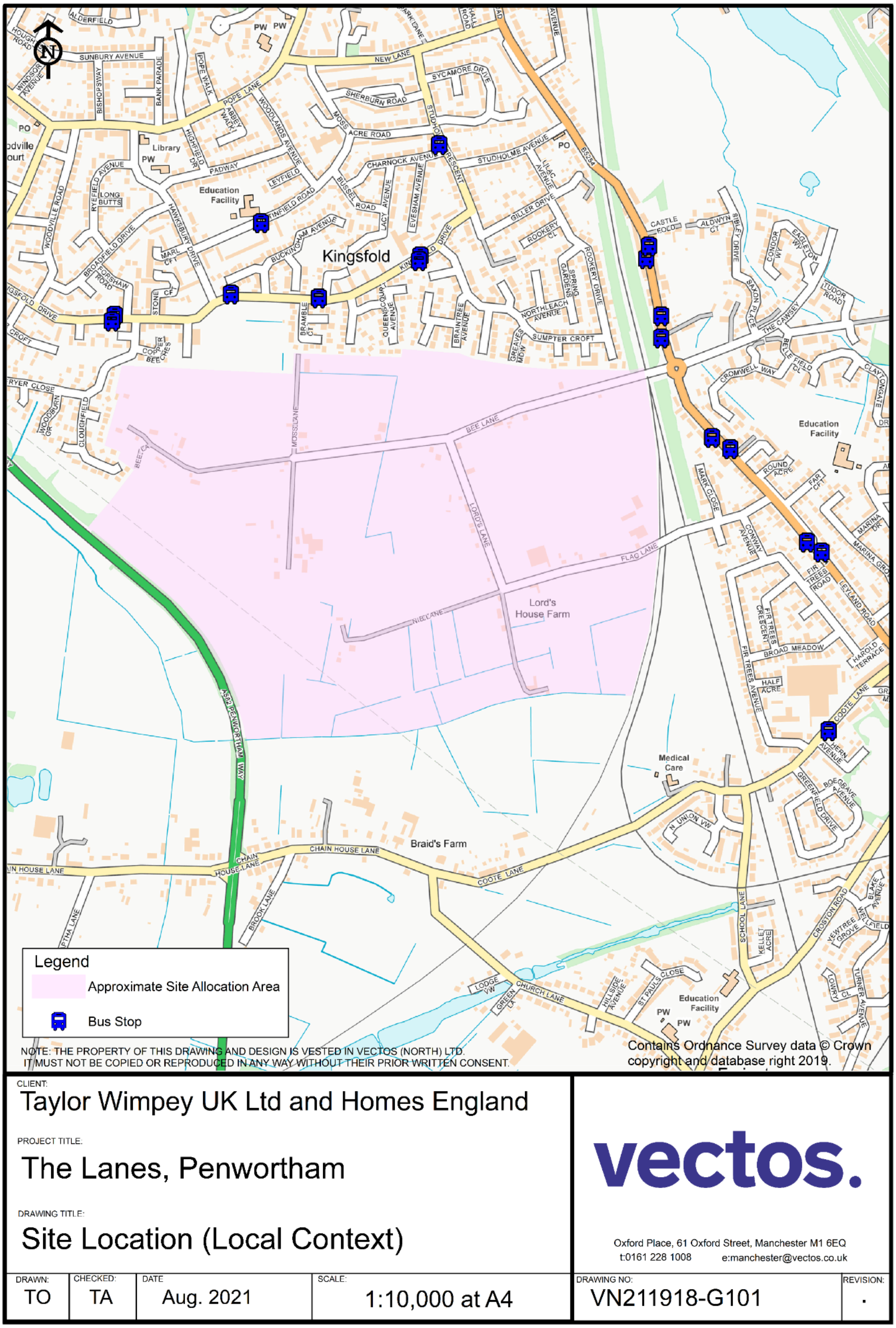


Figure 1.2: Site Allocation Location (Local Context)

1.5 Planning applications for a substantial, part of the overall site allocation and its associated infrastructure are proposed. Specifically, these applications (referred to as the proposed development) seek to provide up to 1,100 dwellings with the intention of delivering much needed housing, whilst also facilitating further development of the site allocation as identified in the Local Plan period, and beyond. The proposed development planning applications are submitted in outline with all matters reserved (including scale, layout, appearance and landscaping) except for the principal means of access. They propose the demolition of certain existing buildings and a residential-led mixed-use development comprising in total:

- Up to 1,100 dwellings (use class C3 and C2), including 30% affordable housing;
- A local centre including retail, employment and community uses, mobility hub and third place working environment space (Use Classes E and sui generis);
- A two-form entry primary school (use class F1);
- Green spaces; and
- Associated infrastructure.

1.6 Access and connectivity with the neighbouring communities, of which this proposed development will form part, is proposed in eight key locations. All of these provide facilities for active travel, including micro-mobility connectivity. Three provide for vehicular movement, including shared travel and private vehicles. The proposed development is permeable throughout by active travel, and by shared travel between the three vehicular accesses. Private vehicle access is predominantly from Penwortham Way, with a small parcel from Bee Lane, and existing serviced properties continuing to be accessible from Flag Lane. There is no private vehicle connectivity between these accesses, without prejudice to through connectivity being provided in the future should the Authorities pursue the Cross Borough Link Road (CBLR) across the site.

Masterplan Principles and Mobility Strategy

1.7 The proposed development for 1,100 dwellings sits as part of a wider site allocation masterplan which proposes the comprehensive residential-led development of the Pickering's Farm site (and safeguarded land).

1.8 The masterplan creates a new vision for living, where people want and have the option to live locally, building a close relationship with their community, whilst also remaining connected to key regional centres through attractive and direct active travel, alongside sustainable shared travel routes which prioritise their convenience.

1.9 It has been prepared in the context of the health and climate agenda, acknowledging national policy as well as SRBC's Climate Emergency declaration and commitment to be carbon neutral by 2030. It allows for the promotion of a healthy living agenda built around an understanding of why and how people access facilities, as well as what this might look like in a post-COVID-19 world.

1.10 A policy driven "Vision and Validate" approach to growth and new living has been adopted, enabling, not just encouraging, climate shift and movement towards healthier, happier, sustainable and stable lifestyles. The vision is to embrace local living and virtual mobility where that is most appropriate, achieving excellent accessibility by the highest priority forms of mobility and minimising road capacity increases, particularly where these are likely to encourage and generate private vehicular traffic.

1.11 The proposed development (and site allocation) benefits from an existing network of lanes which provide local access to properties within the site and form part of an active travel network which also includes PRoW. These routes penetrate into the surrounding residential areas at numerous points providing existing opportunities for accessibility, which can and will be enhanced. These lanes are to be retained with no additional motor vehicle traffic permitted to use them. Instead, existing access to properties will be retained and the routes will continue to be promoted as an active travel network, which will be the primary movement network.

1.12 Community infrastructure, along with sustainable and active travel routes have been considered before any internal highway layouts for motor vehicles. Although already being well positioned to make good use of existing local services and amenities, the provision of a new local centre (with mobility hub and third place working environment), primary school and other community uses as part of the proposed development, accessed via a network of internal active travel routes (both new and existing), will further encourage local living and active travel as all residents will be within an easy walk, scoot or cycle of an increased number of local amenities. The internal network will provide a suitable hierarchy acknowledging national design criteria to promote enhanced streets, informal streets and pedestrian-priority streets with appropriate active frontage to reinforce a low-speed residential environment.

1.13 A new vehicular access is proposed on Penwortham Way in the form of a traffic signal-controlled junction. This will serve the majority of the proposed development for 1,100 dwellings and will also serve as the main vehicular access for the majority of the site allocation. It can be designed acknowledging the County Council's desire to improve the capacity of the Penwortham Way corridor in the future.

1.14 Shared travel in the form of buses, are provided for via the Penwortham Way access with an internal loop provided to ensure good penetration and access to services. In addition, there are existing services along Leyland Road. Other shared travel measures will include car sharing and car pooling, administered through the community concierge team at the primary mobility hub, as well as shared use of e-bikes and micro-mobility systems. The mobility hub provides the flexibility to introduce other systems as attitudes and technology dictate.

1.15 As per the policy approach to movement hierarchy, motor vehicles have been considered after local living, active travel and shared travel.

1.16 Land is protected from physical development for the delivery of a CBLR, as referenced in Local Plan policy. Local Plan policy does not require delivery of a CBLR, however, the delivery of a CBLR is protected. The site design facilitates a CBLR, in such a way that it does not form a barrier to community movement and ambience.

Pre-Application Discussions and Consultation

1.17 The key development principles outlined in this Transport Assessment build upon and reference those outlined in the Local Plan which has been subject to extensive technical input and consultation. It is noted that the previous technical assessments prepared to support the Local Plan concluded that this is one of the most sustainable locations for new development, and that the overall levels of development could be accommodated in terms of their traffic impacts.

1.18 Initial discussions have been coordinated with LCC and Highways England (HE) regarding the proposed development, building upon consultations that informed previous planning applications (Ref: 07/2020/00014/FUL and 07/2020/00015/ORM). Throughout, all parties have reiterated their intention to work proactively and share knowledge so as to ensure the best vision for the proposed development and wider site allocation can be robustly delivered, in line with local and national policy.

1.19 To date, discussions with LCC have focussed on the local road network and accessibility of the site. It is agreed that the site is sustainably located and LCC feel that there are options available to allow development to come forward, underpinned by a clear masterplan which also delivers necessary infrastructure. This is critical to avoid piecemeal development.

1.20 In addition, discussions with HE have focussed on the strategic road network located approximately 2.5km to the to the east of the site. Whilst it is acknowledged that trips associated with the development may not have a significant impact on the operation of the strategic road network when considered across a whole day, HE are particularly interested in the cumulative impacts of development including other development sites with planning permission, but also potential transport network infrastructure improvements.

1.21 Further information regarding consultation is presented in the Statement of Community Involvement prepared by Avison Young which should be read in conjunction with this report.

Scope of Assessment

1.22 This Transport Assessment references guidance in local and national planning policy, including the NPPF. This guidance supports and encourages housing growth and adopts a presumption in favour of plan-led sustainable development which provides benefits in terms of climate, health and the economy. It refers to guidance provided by the Department for Transport (DfT) on 'Travel Plans, Transport Assessments and Statements' (2014).

1.23 The key objectives of this Transport Assessment are to:

- Identify opportunities for non-car-based travel and socially inclusive transport links in line with current best practice and local and national policy;
- Encourage behavioural choice;
- Establish the quantum of traffic demand, assuming an unfettered network, generated by the proposed development;
- Assess iteratively the forecast demands on the local highway network, and make judgements about residual effect, using as a tool micro-simulation modelling using a Vision and Validate approach; and
- Determine suitable accessibility, including transport, measures to maximise the development's accessibility, and connectivity, and to manage the characteristics associated with delivering this site in the context of planning policy.

1.24 The effect of the proposed development on traffic characteristics is a judgement, informed by mathematical forecasts. It considers evidence which identifies that in practice traffic demands (including background traffic quantum) are not fixed, and they fluctuate as a function of many factors including heuristics and in particular perception of inconvenience. The modelling exercise using micro-simulation has been conducted not as an accurate forecast of future reality, but as a useful tool from which judgements can be made.

1.25 The remainder of the Transport Assessment is structured as follows:

- **Section 2: Local Context –** sets out the current position of the proposed development and includes an accessibility audit which reviews the accessibility by all viable modes of transport, and describing the current position in terms of road safety;
- **Section 3: Policy Context –** describes the local and national planning policy and guidance pertinent to the proposed development;
- **Section 4: Emerging Transport Trends –** provides a summary of the trends in travel patterns pre COVID-19 and expected trends following the COVID-19 pandemic, and the effect this will have on travel behaviour;
- **Section 5: Proposed Development –** sets out the development proposals including access, parking, and servicing;
- **Section 6: Trip Generation and Distribution –** sets out the trip generation and distribution methodology for an initial forecast of unfettered demand, including analysis of TRICS data, Census 2011 Journey to Work and National Travel Survey information;
- **Section 7: Highway Network Assessment –** assesses the way in which the characteristics of the highway network are likely to change as a consequence of delivering this allocated site; and
- **Section 8: Summary and Conclusions –** summarises the findings and provides the report conclusions.

2 Local Context

Site Location

2.1 The proposed development site is located approximately 5.5km north of Leyland and 5.5km, south of Preston city centre. It is generally flat and is predominantly in agricultural use with existing field boundaries marked by hedgerows. There are a number of farm buildings, small holdings and existing residential properties located in the vicinity.

2.2 It is situated immediately to the south of the existing residential area of Kingsfold and west of Tardy Gate. Kingsfold has a local centre and Tardy Gate a district centre providing a wide range of shops, services, and facilities.

2.3 To the west of the site is Penwortham Way (part of the A582 corridor) which is a key route connecting the site to Preston, Leyland and the M6 motorway. The West Coast Mainline forms the eastern boundary with agricultural land forming the southern boundary of the proposed development.

2.4 The existing Bee Lane and Flag Lane bridges which cross the West Coast Mainline are the only current points of access for motor vehicles. These routes then serve a number of smaller roads (many of which are adopted) which provide access to existing residents and landowners. There are, however, many additional public rights of way and active travel connections located to the west, north and east providing multiple options to connect to existing communities on foot and by bike.

Local Facilities and Indicative Active Travel Catchments

2.5 Contemporary local and national transport policy states that new developments should be focused on locations which are, or can be made, sustainable. Providing travel choice is policy compliant and essential in today's modern and dynamic society. This focus maximises social inclusion, minimises the number of single car occupancy private car trips, limits the need to travel, helps reduce congestion and helps to improve air quality and health.

2.6 One of the primary factors when considering the suitability of a new development is its proximity, accessibility, and connectivity in relation to key local facilities by non-car modes. Within this context, the development should give priority first to pedestrian and cycle movements both within the scheme and with neighbouring areas.

2.7 The proposed development benefits from a wide range of local facilities being in its vicinity providing the potential to make it a very well-connected development. Such facilities are located in Kingsfold to the north and Tardy Gate to the east, as illustrated in **Figure 2.1.**

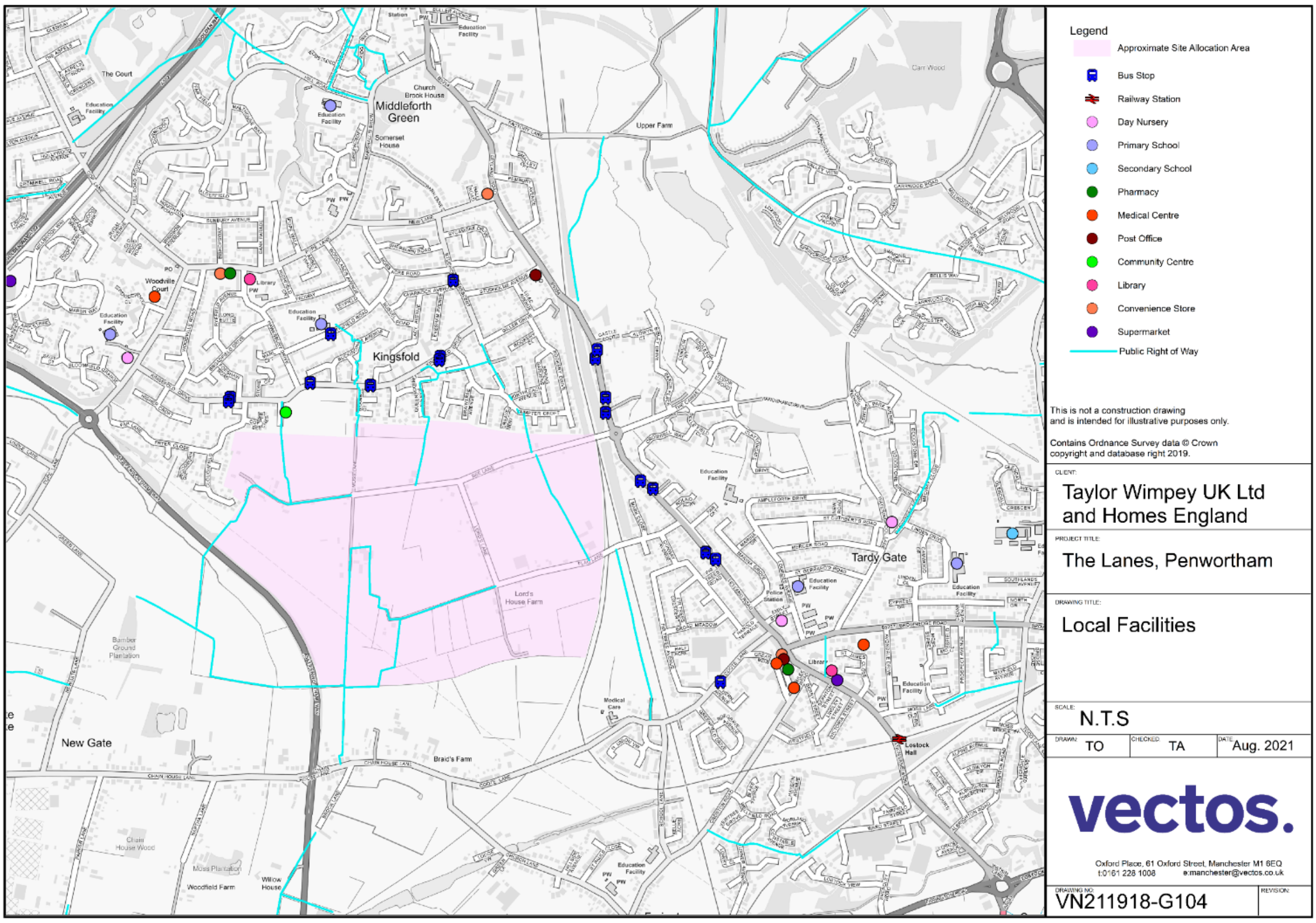


Figure 2.1: Sample Local Facilities

2.8 Specific guidance on the distances that children will walk to school is found in the Department for Education's (DfE) July 2014 document, '*Home to School Travel and Transport*' statutory guidance document. This guidance suggests that the maximum walking distance to schools is 2 miles (or 3.2km) for children under 8, and 3 miles (or 4.8km) for children over the age of 8.

2.9 In addition, A WYG report entitled *'Accessibility – How Far Do People Walk and Cycle'* uses National Travel Survey (NTS) data for the UK as whole, excluding London, and provides an 85th percentile walk distance for:

- All journey purposes – 1,950 metres;
- Commuting – 2,400 metres;
- Shopping – 1,600 metres;
- Education – 3,200 metres or 4,800 metres; and
- Personal Business – 1,600 metres.

2.10 In terms of time, this equates, for instance, to approximately 30 minutes for commuting.

2.11 It should be noted that accessibility is not exclusively a function of distance; it being also related to the quality of the local environment and peer culture. For example, with reference to cycle journeys, the tendency for people to choose this mode is related to quality of route, barriers, whether the bike is electrically assisted, attitude to health, the journey purpose, the facilities at either end and personal matters. A half hour journey by bike at a comfortable pace, on typical streets without cycle priority, will typically encompass a distance of approximately 8 km.

2.12 **Figure 2.2** illustrates a 1km and 2km catchment from the access on Moss Lane, **Figure 2.3** shows this from Bee Lane, and **Figure 2.4** from Flag Lane. In addition, **Figure 2.5** presents a 5km and 10km typical catchment by bike. These catchments encompass an area covering the communities of Kingsfold, Penwortham, Tardy Gate and Lostock Hall in the immediate vicinity, but also Preston to the north, Farington and Leyland to the south, Bamber Bridge to the east and New Longton to the west.

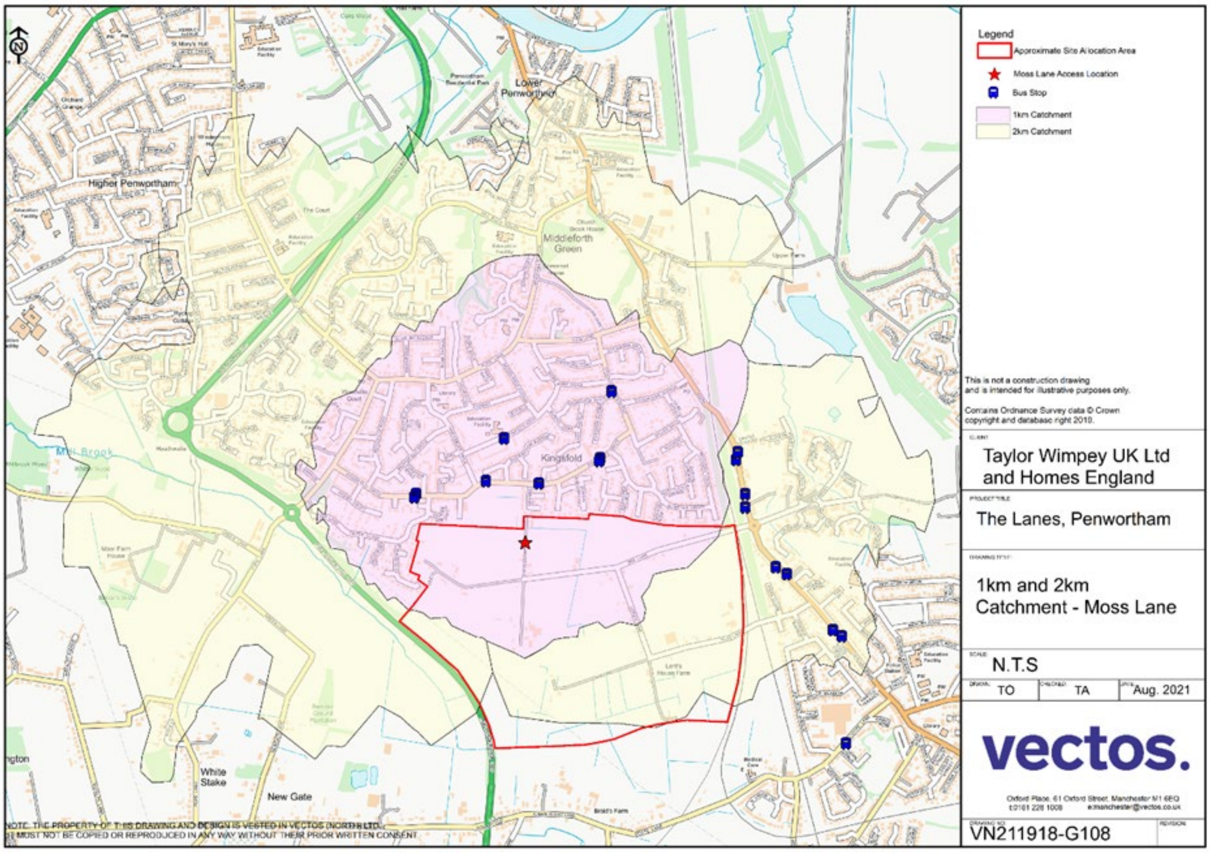


Figure 2.2: 1km and 2km Catchment – Moss Lane

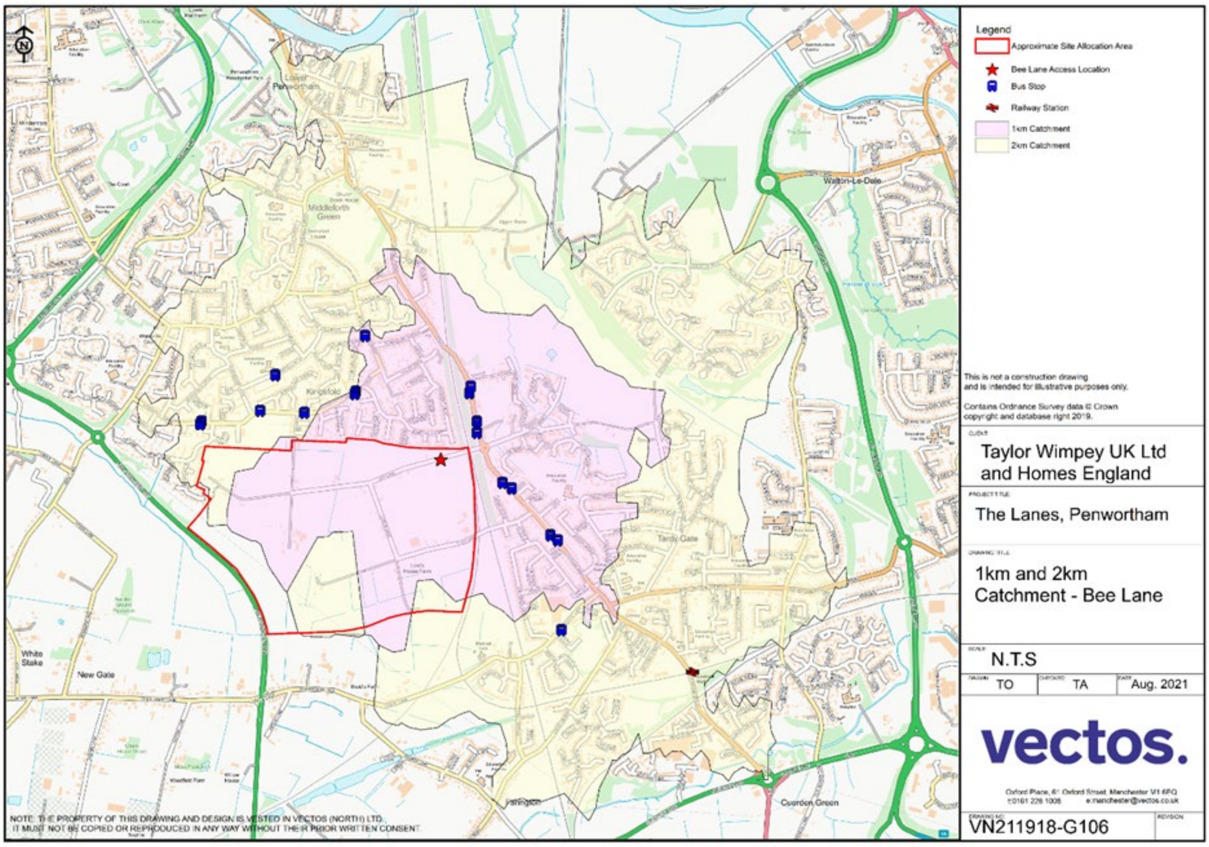


Figure 2.3: 1km and 2km Catchment – Bee Lane

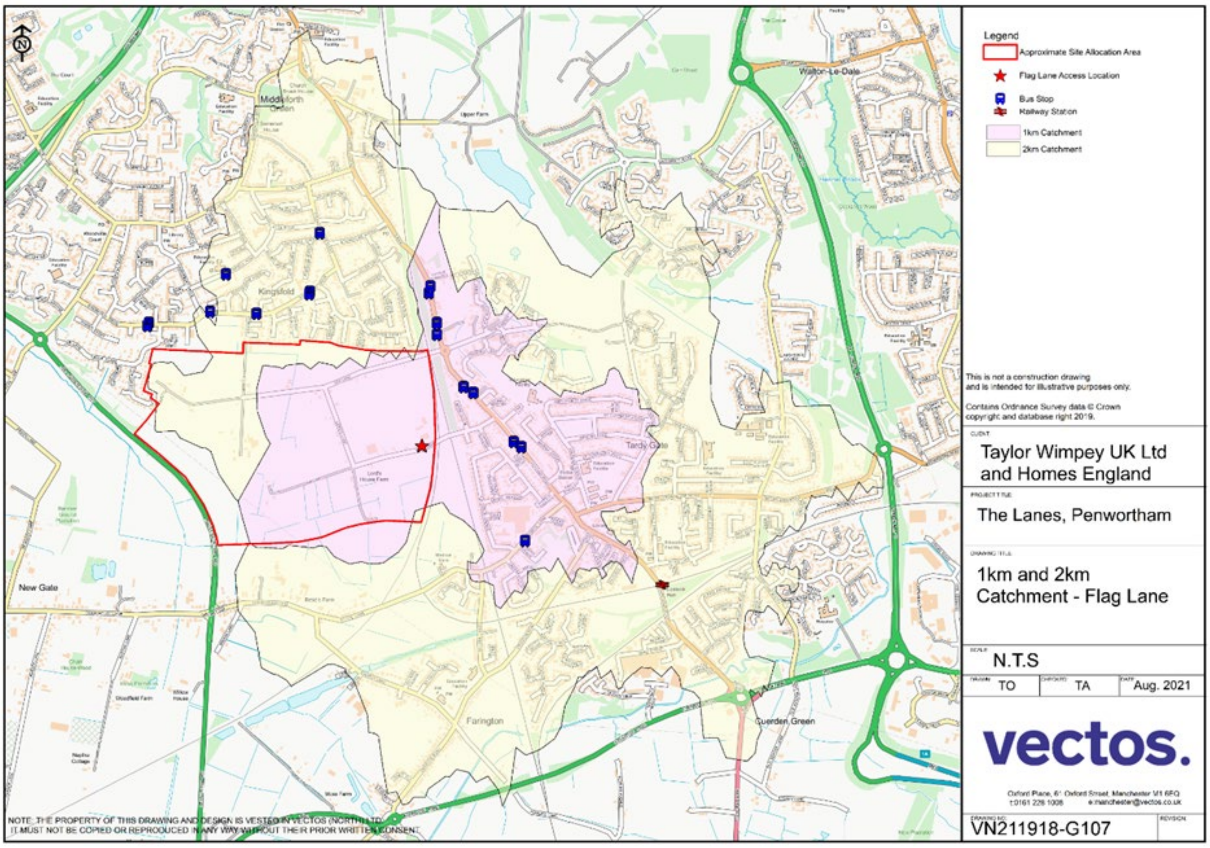


Figure 2.4: 1km and 2km Catchment – Flag Lane

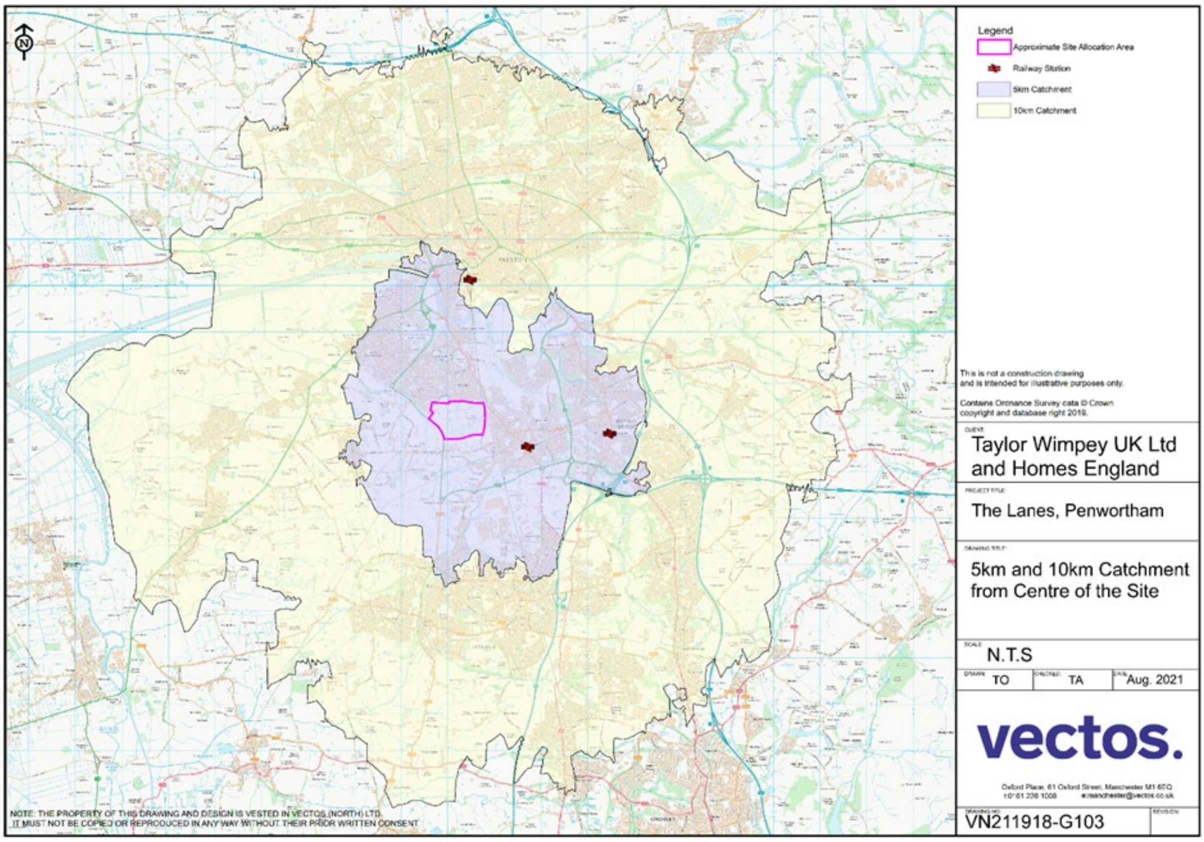


Figure 2.5: 5km and 10km Catchment

2.13 The proposed development benefits from a wide range of local facilities being in its vicinity providing the potential to make it a very well-connected development. Such facilities are located in Kingsfold to the north and Tardy Gate to the east. **Table 2.2** provides a sample list of local facilities and services located within Kingsfold and Tardy Gate along with their distances from the centre of the proposed development.

Table 2.2: Distance to Local Service and Amenities

Local Amenity	Distance
Schools	
Kingsfold Primary School	1,080m
Our Lady and St Gerard's RC Primary School	1,190m
Penwortham Broad Oak Primary School and Marylands Nursery School	1,510m
Middleforth C of E Primary School	1,900m
Lostock Hall Community Primary School	2,400m
Penwortham Girls High School	2,700m
Lostock Hall Academy	3,000m
All Hallows Catholic High School	3,000m
Penwortham Priory Academy	3,800m
Community Infrastructure	
Penwortham Town Council and Community Hall	700m
Kingsfold Play Area	800m
Local Play Area (Eagleton Way)	970m
Local Play Area (Handshaw Drive)	990m
Kingsfold Library	1,100m
Lostock Hall Recreation Ground	1,380m
Services and Amenities	
Penwortham Lane Post Office	1,100m
Tardy Gate	1,130m
Spar	1,180m
Lostock Hall Post Office	1,180m
Kingsfold Pharmacy	1,200m
Cooperative	1,370m
McColl's Convenience Store	1,370m
Bargain Booze	1,450m
Cop Lane Post Office	1,450m
Kingsfold Medical Centre	1,500m

2.14 **Table 2.2** highlights that the proposed development is well connected and accessible by foot or by cycle to a wide range of local amenities within Kingsfold, Tardy Gate and Lostock Hall. This is consistent with the planning authority's judgement that this is a sustainable location, warranting its inclusion as a significant allocation within the Local Plan.

2.15 The proposed development also includes provision for a primary school, employment uses, opportunity for food retail within the local centre and community facilities, which will substantially enhance the sustainability of the site, through internalising a significant proportion of vehicle trips, particularly those associated with school journeys during the morning peak period.

Active Travel Links for Local Living

2.16 The pedestrian facilities in the vicinity of the proposed development include formal footways, shared footways/cycleways, and PRoW. As shown in **Figure 2.6** there are currently twenty-one PRoW crossing or in the immediate proximity of the site.

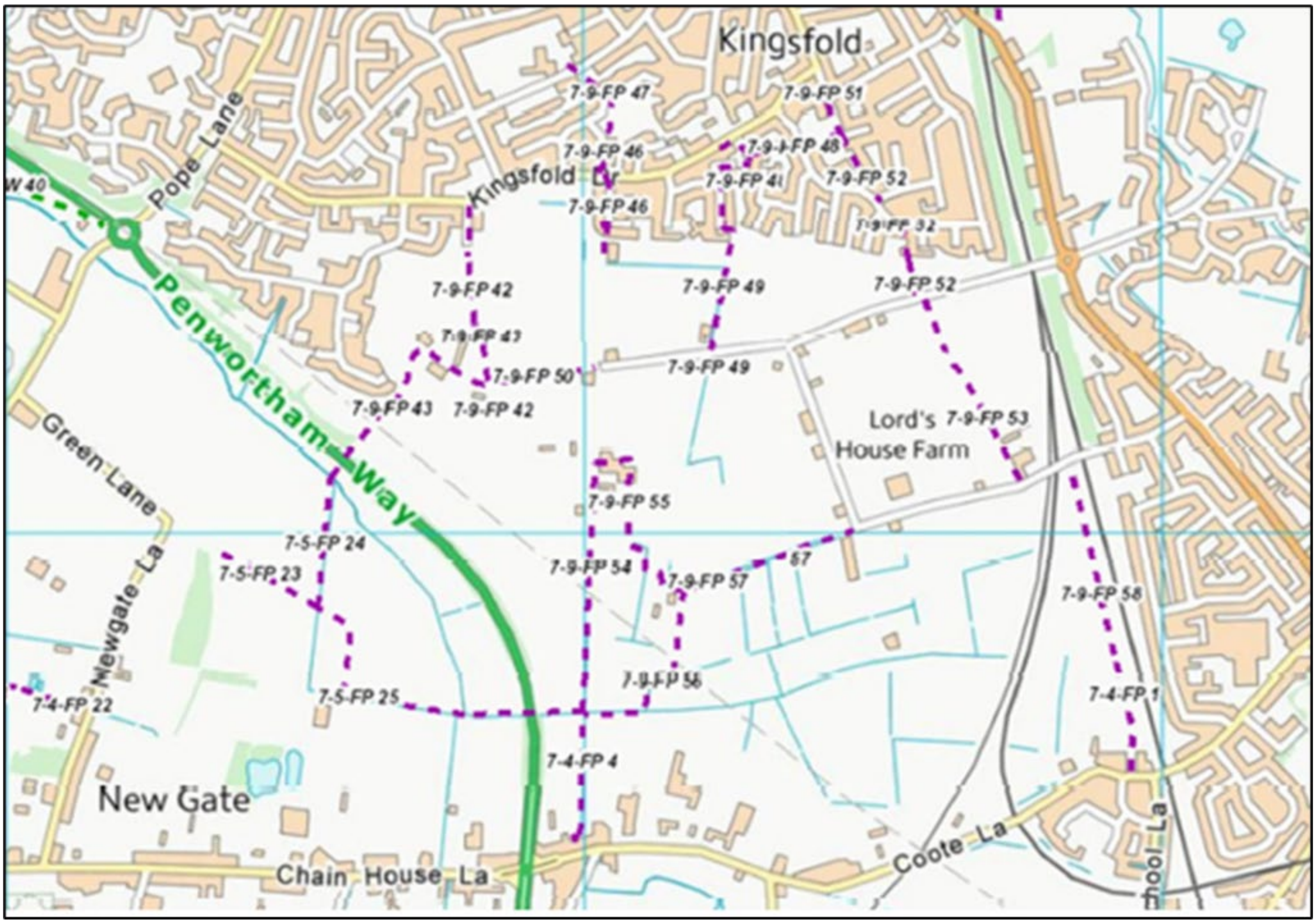


Figure 2.6: Public Rights of Way Map **(source: Lancashire County Council)**

2.17 **Figure 2.7** highlights that there are multiple points of existing connection with existing communities to the north, east and west either via the adopted highway on Bee Lane, Flag Lane and Moss Lane, or via the network of PRoW. Footpath 7-9-FP42 provides a connection between Bee Lane and Kingsfold Drive, as does Moss Lane and Footpath 7-9-FP46, Footpath 7-9-FP49 and Footpath 7-9-FP-52.

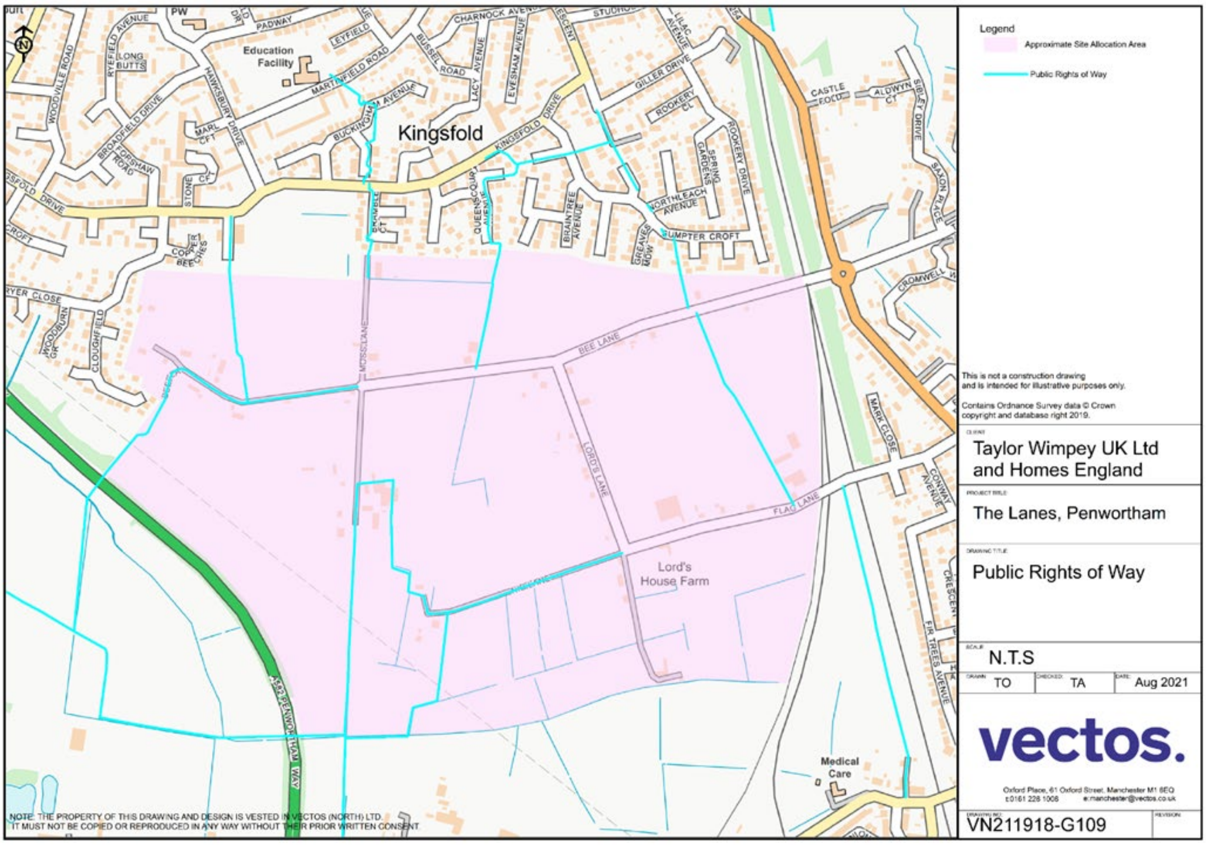


Figure 2.7: Public Rights of Way Connections to the Existing Built-Up Area

2.18 Footpath 7-9-FP42 connects to Footpath 7-9-FP43 (via Footpath 7-9-FP50) by way of a short, paved section which then provides access to the Clough Field residential area by way of a short alleyway. Onward journeys are then facilitated along quiet residential streets to controlled crossing facilities at the new A582 Penwortham Bypass roundabout to the west.

2.19 It is noted that there is a desire from Penwortham Town Council to improve this western part of the PRoW network to form part of a wider cycle loop which is referenced in their Neighbourhood Plan. This can be facilitated by the proposed development.

2.20 In addition to the PRoW network, there are sections of Bee Lane, Moss Lane, Lord's Lane and Flag Lane that are adopted highway and provide a network of quiet lanes, connecting to routes and infrastructure further west. These lanes are currently lightly trafficked with some used to provide access to existing residential properties, as well as being leisure active travel routes. Many of the routes are surfaced, with street lighting and good intervisibility, with the widths and verges providing a natural control of vehicle speeds.

2.21 In the wider area, pedestrian facilities within the Kingsfold, Tardy Gate and Lostock Hall residential areas are generally of a good standard with footways and street lighting provided along all roads within the built-up area. There are dropped kerbs and tactile paving provided at some but not all key crossing points.

2.22 **Figure 2.8** provides an extract of the Preston and South Ribble Cycle Map which indicates that National Cycle Route 55 is located approximately 2.4 kilometres to the east of the site. This route consists of a number of off-road cycle paths which ultimately form part of a route over the River Ribble into Preston city centre and Preston Railway Station.

2.23 National Cycle Route 62 is located approximately 2.6 kilometres to the north west which connects Fleetwood on the Fylde region of Lancashire with Selby in North Yorkshire and form the west and central sections of the Trans Pennine Trail.

2.24 It is noted that the extract highlights a proposed cycle route along Penwortham Way and Flensburg Way which would provide an additional route to Leyland and Leyland Business Park. This route would also provide northbound connections to Penwortham and the cycle route along Golden Way.

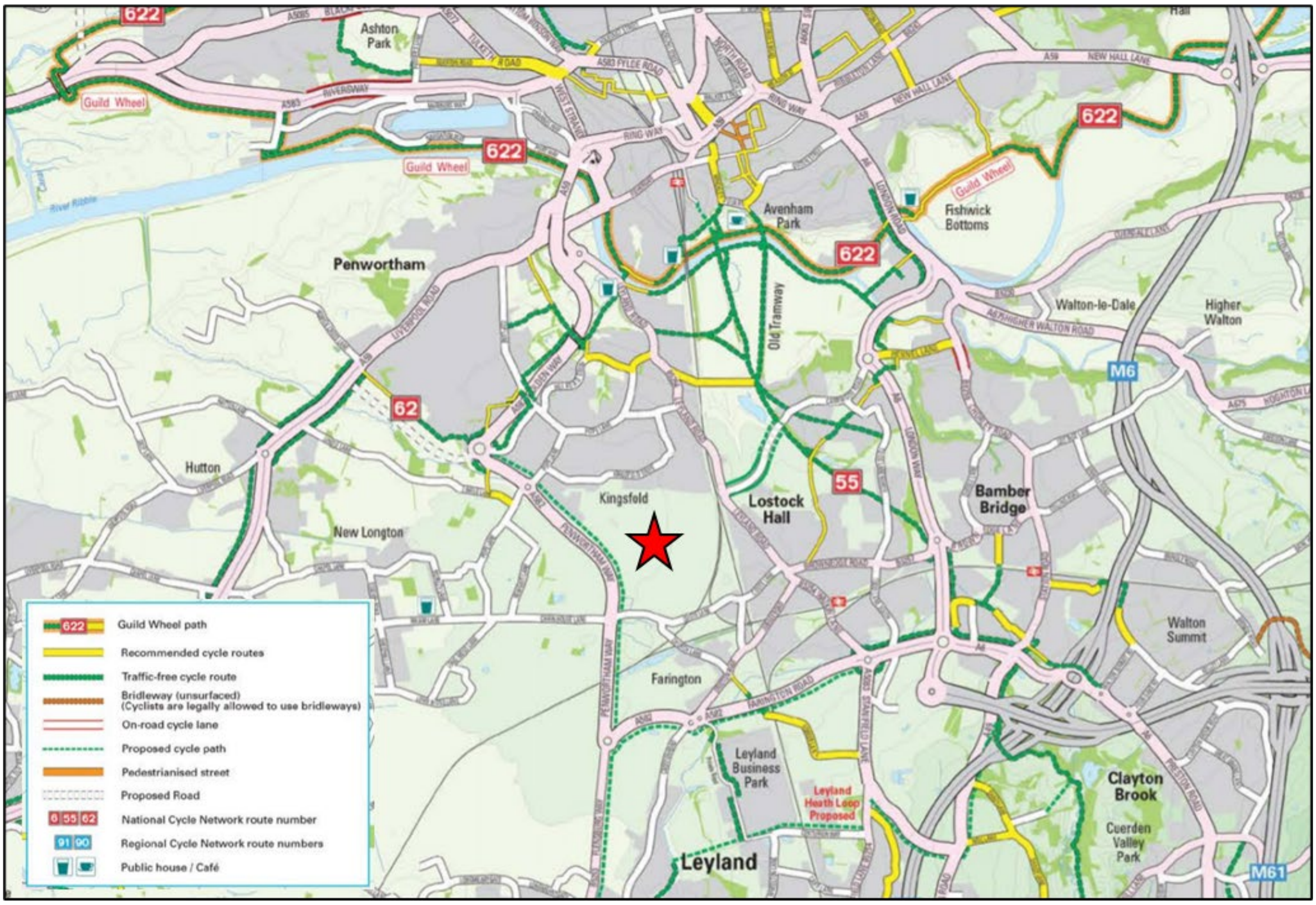


Figure 2.8: Extract of Preston and South Ribble Cycle Map **(source; Visit Lancashire)**

Shared Travel Links

2.25 **Figure 2.9** shows the location of existing local bus stops and the frequency of the services provided at these stops. This plan shows that at both the Kingsfold Drive and Leyland Road stops there is a service frequency of 4 to 6 services per hour. These services connect these stops with many local destinations including Preston, Lostock Hall and Moss Side. Higher frequency services are provided within Tardy Gate and Lostock Hall near Lostock Hall Railway Station.

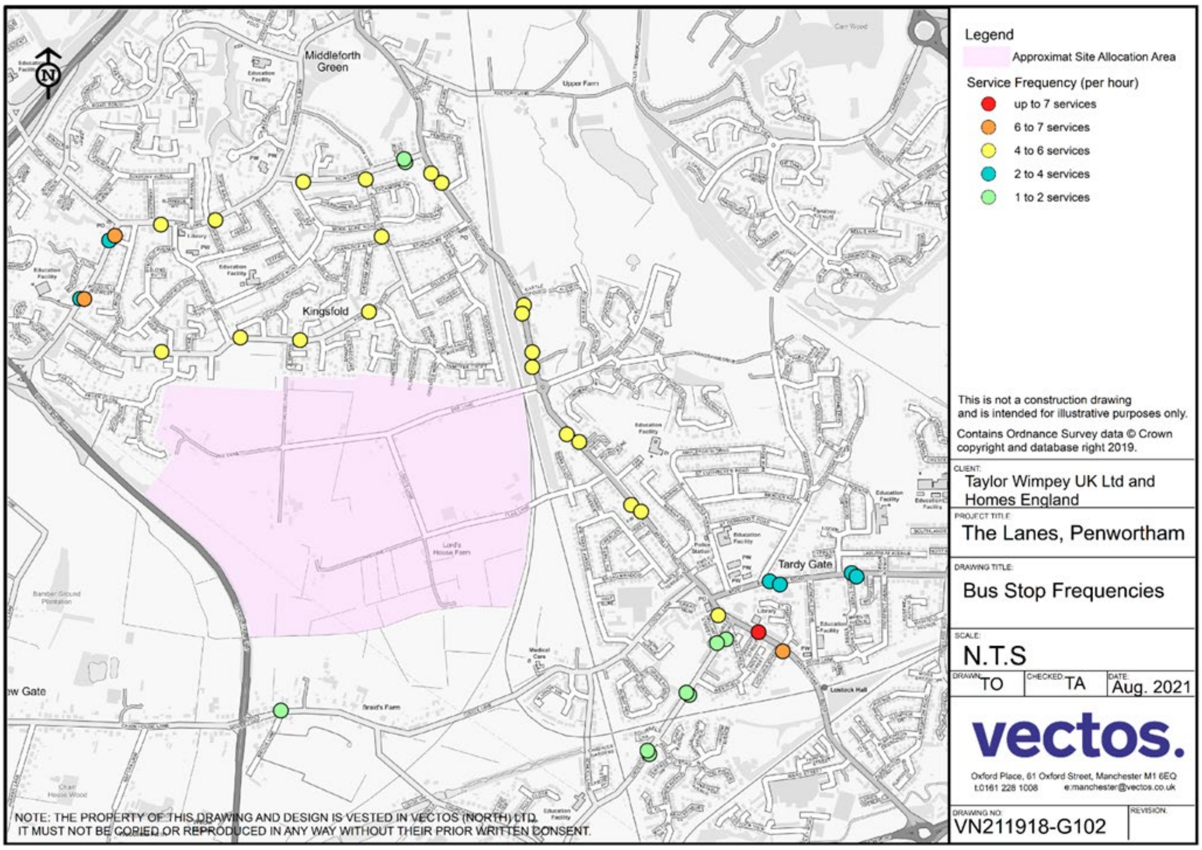


Figure 2.9: Bus Stop Locations and Frequencies

2.26 A summary of the most frequent services provided at these stops and their approximate frequencies is provided in **Table 2.3** below.

Table 2.3: Summary of Existing Bus Services

No.	Route	Typical Frequency (minutes)						
		Mon. to Fri.			Sat.			Sun.
		Mor.	Day	Eve.	Mor.	Day	Eve.	Day
Kingsfold Drive Stops								
3	Preston – Preston Circular via Cop Lane	10 services	10	10-20	6 services	10	10-20	15
Leyland Road Stops								
111	Preston – Moss Side via Lostock Hall	8 services	12	13	3 services	12	13	30

2.27 As shown in **Table 2.3**, route 3 provides a very frequent service along Kingsfold Drive providing connections into Preston city centre. Route 111 operating from Leyland Road also provides a high frequency service into Preston city centre and south towards Moss Side via Lostock Hall. It is therefore considered that the proposed development site will be highly accessible by bus.

2.28 In addition to route 3, route 719 operates along Kingsfold drive operating 1 service a day. This is a school service providing connections to Priory Technical College. In addition to the 111, routes 670, 698, 699, 714, 767 and 984 operate 1 service per day from the stops on Leyland Road. The majority of these routes are school services with the 670 and 984 providing connections to Hutton Grammar School, the 698 and 714 to Penwortham All Hallows RC High School and the 767 operating the return route from Penwortham All Hallows RC High School.

2.29 The closest railway station to the proposed development is Lostock Hall within a 20-30 minutes walk or 6-10 minutes cycle ride and is accessible via Leyland Road and Bee Lane / Flag Lane. The station is managed by Northern, has two platforms and provides one service per hour to Preston, Blackburn, Burnley, Nelson, and Colne.

2.30 There is an off-road cycle route located to the east of the Proposed Development which provides a connection to the centre of Preston and Preston Railway Station which is within the 5km cycle catchment (less than 20 minutes cycle ride). Preston is on the West Coast Mainline with frequent local, regional, and national services provided to a range of destinations including Blackpool, Lancaster, Manchester, Liverpool, Barrow-in-Furness, London, Edinburgh, and Glasgow. Therefore, there would be potential for rail to be used by residents as part of a multi-modal journey with cycling. Preston Railway Station includes over 200 cycle parking spaces as part of a cycle hub.

Local Highway Network

2.31 The proposed development is bound by Penwortham Way to the west. To the east is the Leyland Road corridor accessed via Bee Lane and Flag Lane which are currently the only vehicle access points. There are also a number of rural lanes – Bee Lane, Flag Lane, Lord’s Lane, and Moss Lane – in the vicinity which provide access to the existing residential properties. These are identified in **Plan 10**.

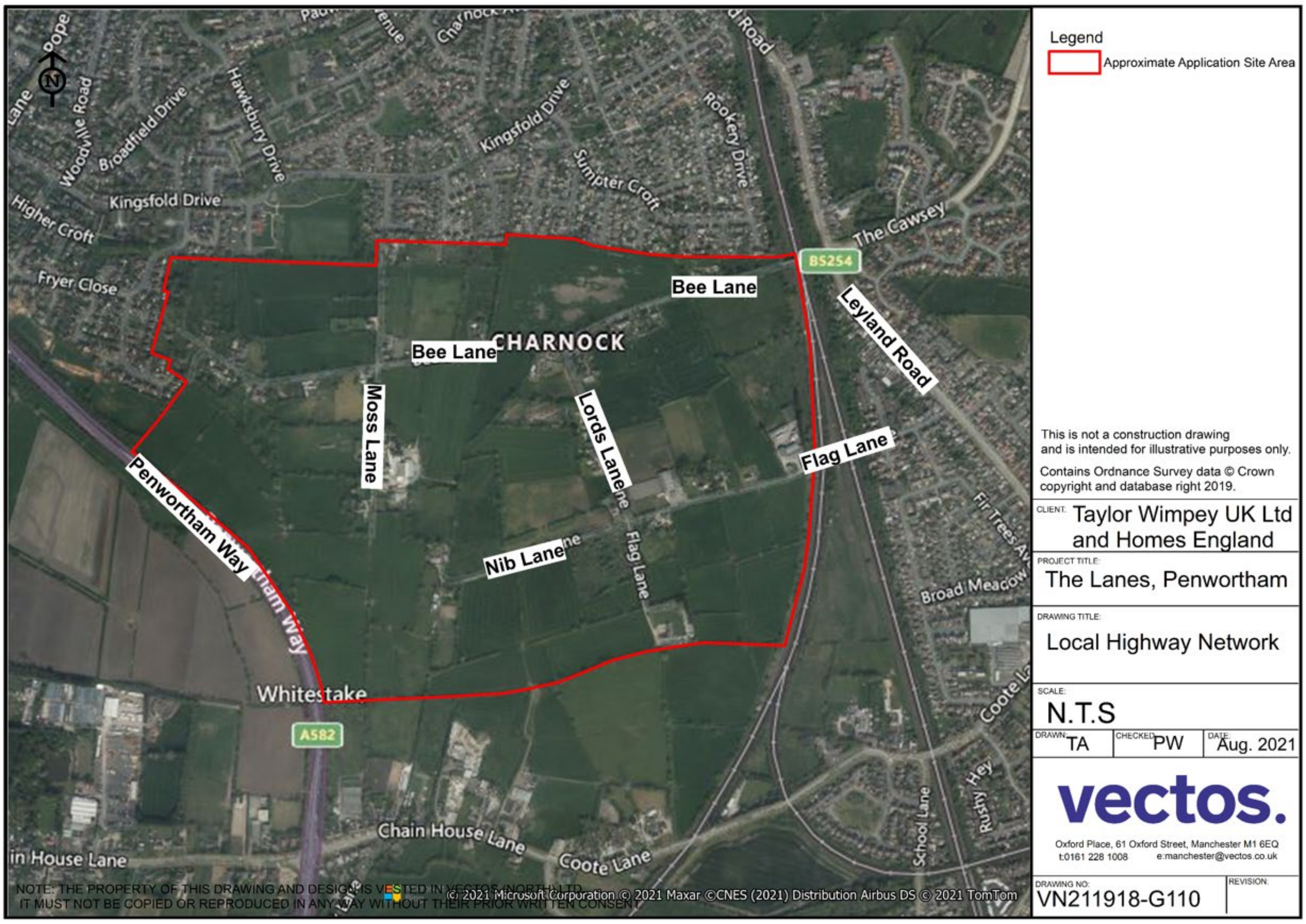


Figure 2.10: Local Highway Network

Penwortham Way

2.32 Penwortham Way is an ‘A’ classified road and forms part of the A582 which is a principal distributor road extending for approximately 8km from the M65/A6/A582 junction to the A582/A59 junction. In the vicinity of the proposed development, Penwortham Way is a single-carriageway road and continues in a north/south alignment past the site.

2.33 Penwortham Way is approximately 7.3 metres wide with no footways along either side of the carriageway in the vicinity of the proposed development. There is a 50mph speed limit enforced which remains in operation along the A582 towards the A582/Golden Way and A582/A59 Golden Way roundabout. Approximately 250 metres south of the Penwortham Way/Chain House Lane junction, the A582 increases in speed to 60mph.

2.34 To the north, Penwortham Way forms a signal-controlled junction with Pope Lane and Golden Way. To the south, Penwortham Way provides connections to Chain House Lane by way of a four-arm signalised cross-roads. Street lighting is provided along the length of the carriageway between the A582 Penwortham Way/Chain House Lane signalised cross-roads and the A582/A59 Golden Way roundabout.

Leyland Road

2.35 To the east, Leyland Road (B5254) runs along a north to south alignment between the Stanfield Lane/Farington Road/Lostock Lane/Watkin Lane junction to the A59/Leyland Road roundabout junction. It passes through an urban area with residential access road and residential and retail properties fronting directly onto both sides of the carriageway. Leyland Road provides connections to Tardy Gate, Penwortham Gate and Lower Penwortham.

2.36 In the vicinity of the Bee Lane and Flag Lane junctions, there are footways and street lighting provided along both sides of the carriageway. These footways provide connections to the bus stops located along this road. Both controlled and uncontrolled crossing facilities are provided along the Leyland Road corridor to facilitate movement.

Bee Lane

2.37 Bee Lane forms the northern access between the B5254 Leyland Road and crosses the West Coast Mainline. It is a single-lane rural road extending for approximately 1.2 kilometres along an east-west alignment from the B5254 Leyland Road/Bee Lane/The Cawsey four-arm roundabout. The carriageway varies in width from 6.5 metres at its eastern end to 2.7 metres at its western end.

Flag Lane

2.38 Flag Lane forms the southern access between the B5254 Leyland Road and crosses the West Coast Mainline. It is a single lane residential/rural lane and extends for approximately 600 metres from the priority-controlled T-junction with Leyland Road and also continues in an east-west alignment parallel to Bee Lane.

2.39 There is a small section of Flag Lane between Leyland Road and the West Coast Mainline that is residential in nature with a carriageway width between 4.7 metres and 5 metres. Footways and street lighting are provided along both sides of the carriageway along this section of Flag Lane. Residential properties also front onto Flag Lane to the east of the railway line with driveway access situated along both sides of the carriageway.

Lord's Lane / Moss Lane / Nib Lane

2.40 Lord's Lane, Moss Lane and Nib Lane are all rural single-carriageway roads of varying widths which currently provide connections to the residential and farm buildings in the vicinity of the proposed development. Lord's Lane continues in a north/south alignment and provides connections between Bee Lane and Flag Lane. Nib Lane continues in an east/west alignment from its junction with Flag Lane. While Moss Lane continues in a north/south alignment from its junction with Bee Lane on the western side of the site. Traffic flows and vehicle speeds have been observed to be very low.

Accident Review

2.41 Analysis of accident records for the most recently available 5-year period has been conducted with reference to LCC's MARIO service. The study area predominantly covers the A582 corridor (including Penwortham Way) and Leyland Road.

2.42 There are few recorded accidents on Penwortham Way with small clusters identified at the Pope Lane junction to the north and the Chain House Lane junction to the south. The majority of these accidents are recorded as being Slight with few Serious accidents and no Fatal accidents identified within the available data. It is noted that the Pope Lane junction has been improved to incorporate signal control, cycle facilities and controlled crossing points within the 5-year period for which data is available.

2.43 Along the remainder of the A582 corridor which includes Farington Lane and Lostock Lane, there are small clusters of Slight accidents at junctions, but very few Serious and no Fatal accidents. This part of the network includes junctions with Watkin Lane and the A6 which accommodate high volumes of traffic at certain times during the day. Again, it is noted that the Farington Lane/Watkin Lane junction was improved in 2015 to incorporate cycle facilities and controlled crossing points.

2.44 There are few accidents recorded on Leyland Road. Three accidents have been recorded at the Bee Lane roundabout, with two accidents recorded at the Flag Lane junction, all of which were slight accidents. There are small clusters of accidents on Leyland Road at junction with Coote Lane and Brownedge Road, of which only three were recorded as being serious.

2.45 It is noted that one fatal accident has been recorded at the Fir Trees Road junction with Leyland Road which involved a minibus and motorcycle in 2016.

2.46 Overall, it is considered that although there are small clusters of accidents at junctions on the A582 corridor and Leyland Road, it does not suggest that there are any highway design features that might be contributing to the occurrence of accidents on the network.

3 Policy

National Planning Policy

National Planning Policy Framework

3.1 The latest iteration of the National Planning Policy Framework (NPPF) was published by the Ministry for Housing, Communities and Local Government (MHCLG) in July 2021 and provides guidance for English Council's in producing local plans and making decisions on planning applications. At the heart of the NPPF is a presumption in favour of sustainable development, which is to be seen as a golden thread for plan making and decision taking.

3.2 In respect of promoting sustainable transport, the NPPF outlines that transport issues should be considered from the earliest stages of development proposals, so that the potential impacts of development on transport networks can be addressed. Plans and decisions should take account of:

- Opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;
- Opportunities to promote walking, cycling and public transport use are identified and pursued;
- The environmental impacts of traffic and transport infrastructure can be identified, assessed, and considered – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and
- Patterns of movement, streets, parking and other transport considerations are integral to the design of schemes and contribute to making high quality places.

3.3 The NPPF defines sustainable transport modes as any efficient, safe and accessible means of transport with overall low impact on the environment, including walking and cycling, low and ultra-low emission vehicles, car sharing and public transport. With this in mind, it states that development should:

- Give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;
- Address the needs of people with disabilities and reduced mobility in relation to all modes of transport;
- Create places that are safe, secure, and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;
- Allow for the efficient delivery of goods, and access by service and emergency vehicles; and
- Be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible, and convenient locations.

3.4 It goes on to state that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe. There is no expression of national planning policy that establishes a pass/fail test based on empirical traffic modelling of traffic impact in a commuter peak period. The bar to what is therefore unacceptable in transport impact terms, is set very high.

3.5 Finally, the NPPF notes that all developments that will generate significant amounts of movement should be required to provide a Travel Plan. Accordingly, a Framework Travel Plan has been prepared in support of this application, which will form the basis of a long-term management strategy for the site, delivering sustainable transport objectives.

PPG: Travel Plans, Transport Assessments and Statement in Decision-Taking

3.6 In March 2014, the Ministry of Housing Communities and Local Government in conjunction with the DfT, released advice on when transport assessments and transport statements are required, what they should contain (which is intended to assist stakeholders in determining whether an assessment may be required) and, if so, what the level and scope of that assessment should be.

3.7 The advice reflects current Government policy promoting a shift from the ‘predict and provide’ approach to transport planning to one more focused on sustainability. The document focuses on encouraging environmental sustainability, managing the existing network, and mitigating the residual impacts of traffic from the development proposals.

3.8 The guidance sets out that Travel Plans, Transport Assessments and Statements can positively contribute to:

- Encouraging sustainable travel;
- Lessening traffic generation and its detrimental impacts;
- Reducing carbon emissions and climate impacts;
- Creating accessible, connected, inclusive communities;
- Improving health outcomes and quality of life;
- Improving road safety; and,
- Reducing the need for new development to increase existing road capacity or provide new roads.

3.9 These documents support national planning policy which sets out that planning should actively manage patterns of growth in order to make the fullest possible use of public transport, walking and cycling, and focus significant development in locations which are or can be made sustainable. A Transport Assessment and Framework Travel Plan have been produced to support the planning application and have been completed with this guidance in mind.

Manual for Streets and Manual for Streets 2

3.10 The Department for Transport's 'Manual for Streets' replaced their general road and street design guidance manual 'DB32' in 2007 and specifically focuses on lightly trafficked residential streets and highways. In terms of design it states that a key consideration for achieving sustainable development is how the design can influence how people choose to travel. Designers and engineers need to respond to a wide range of policies aimed at making car use a matter of choice rather than habit or dependence. Local transport plans and movement strategies can directly inform the design process as part of the policy implementation process.

3.11 By creating linkages between new housing and local facilities and community infrastructure, the public transport network and established walking and cycling routes are fundamental to achieving more sustainable patterns of movement and to reducing people's reliance on the car.

3.12 Manual for Streets 2 expands on the design advice in Manual for Streets 1 to include how to plan and improve busy urban and rural streets.

The Strategic Road Network: Planning for the Future

3.13 Highways England note that operating an effective and efficient strategic road network makes a significant contribution to the delivery of sustainable economic growth. To assist with this, Highways England's 'The Strategic Road Network: Planning for the Future' (2015) provides guidance and clarity on the key elements to be considered when assessing planning applications and Local Plan allocations. Key to all of this is early engagement and ensuring that any issues that take time to analyse and resolve are identified as soon as possible.

3.14 It acknowledges that Transport Assessments should be carried out in line with prevailing Government guidance. Where there are physical changes proposed to the network, schemes must also be subject to road safety, environmental and non-motorised user audits with all works conforming to requirements outlined in the Design Manual for Roads and Bridges (DMRB).

The Strategic Road Network and the Delivery of Sustainable Development (2013)

3.15 The Department for Transport's Circular 02/2013 'The Strategic Road Network and the Delivery of Sustainable Development' provides more detailed information relating to how Highways England engage with communities and the development industry to deliver sustainable development.

3.16 It highlights that development proposals are likely to be wholly acceptable if they can be accommodated within the existing capacity of a section of the strategic road network, or if they do not increase demand for use of the section that is already at full capacity.

3.17 In terms of infrastructure, it is noted that any capacity enhancements or new infrastructure required to deliver strategic growth should be identified at the Local Plan stage. In addition, where development proposals are consistent with an adopted Local Plan, Highways England would normally look to inspect the detail of the proposed transport solutions rather than the principle of the development itself.

Local Planning Policy

Lancashire County Council Local Transport Plan (LTP3)

3.18 LCC's LTP3 was adopted in May 2011 and covers the period 2011 to 2021 and sets out to increase prosperity and well-being for all communities within Lancashire. While the LTP3 does not provide a list of specific aims and objectives, the following transport priorities are listed:

- Improving access into areas of economic growth and regeneration;
- Providing better access to education and employment; and
- Improving people's quality of life and wellbeing.

3.19 To achieve this, The LTP3 sets out the following goals:

- To secure a strong economic future by making transport and travel into and between economic centres more effective and efficient by improving links to neighbouring major economic areas and beyond;
- To improve the accessibility, availability, and affordability of transport as a contribution to the development of strong and cohesive communities;
- To create more attractive neighbourhoods by reducing the impact of transport on our quality of life and by improving our public realm; and
- To make walking and cycling more safe, convenient, and attractive, to bring improvements in the health of Lancashire's residents.

Central Lancashire Core Strategy

3.20 The Central Lancashire Core Strategy was adopted in July 2012 and was produced by the Central Lancashire authorities of Preston, South Ribble and Chorley, with assistance from LCC. The Core Strategy is a key document in Central Lancashire's Local Development Framework. Its main purpose is to help co-ordinate development in the area and contribute to boosting investment and employment.

3.21 The strategy refers to the site by its location as land to the south of Penwortham and North of Farington and is one of three proposed strategic locations within Lancashire. The location is of strategic significance due its ability to significantly contribute to South Ribble's infrastructure and housing requirements. The Strategy outlines four strategic objectives which relate to the development site and associated transport infrastructure as follows:

- SO1 – To foster growth and investment in Central Lancashire in a manner that makes the best use of infrastructure and land by focusing on the Preston/South Ribble Urban Area, and the Key Service Centre of Leyland and Chorley.
- SO2 – To ensure there is sufficient and appropriate infrastructure to meet future needs, funded where necessary by developer contributions.
- SO3 – To reduce the need to travel, manage car use, promote sustainable modes of transport, and improve the road network to the north and south of Preston.
- SO4 – To enable easier journeys into and out of Preston City Centre and east/west trips across South Ribble, improve movement around Chorley, as well as safeguard rural accessibility, especially for mobility impaired people.

3.22 The document outlines that developer contributions will be used to fund improvements to and construction of new infrastructure in association with new developments. Existing Section 106 and Community Infrastructure Levy (CIL) charges will be applied to new developments within the borough.

3.23 Policy 2 of the Core Strategy relates to infrastructure and outlines that the Council will work with infrastructure providers to establish works and/or service requirements which will arise from or be made worse by development proposals. It goes on to highlight that improvements to the A582 corridor are in the process of being delivered as part of the South Ribble Western Distributor Scheme. The aim of this scheme is to increase road capacity on the A582 by upgrading it to a dual carriageway along its full length between Cuerden and Preston City Centre. This enhancement will enable the full development of, and access to, the Cuerden strategic employment site, the adjacent Lancashire Business Park and will unlock housing sites to create over 2,700 homes.

3.24 Policy 3 of the Core Strategy relates to travel. This policy states that the best approach to planning for travel will involve a series of measures which will include improving pedestrian facilities, improving opportunities for cycling by completing the Central Lancashire Cycle Network of off-road routes and supplementing this with an interconnected system of on-road cycle lanes and improving public transport.

Central Lancashire Highways and Transportation Masterplan

3.25 The Central Lancashire Highways and Transportation Masterplan (CLHTM) was adopted in March 2013 and represents LCC's priorities for future investment in highways and transport across central Lancashire. The CLHTM is the start of a delivery programme which will see new road space built, public transport priorities along key corridors into Preston and between Leyland and Chorley, and public realm improvements in city, town, and local centres.

3.26 The CLHTM proposed major road schemes which are vital to the vision of creating more capacity on Lancashire's roads as follows:

- A major new road linking Preston and southern Fylde to the M55 and associated link roads;
- Capacity upgrades to accommodate more traffic along the A582 between Cuerden and the A59 at Penwortham; and
- Providing critical congestion relief on the A6 to the north of Preston by building the Broughton Bypass.

3.27 In relation to better public transport, the CLHTM proposes improvements to the main railway stations and bus corridors within Lancashire and outlines that road space will be dedicated for public transport once the new distributor roads are open. The Masterplan will focus on;

- An investment focus on nine ‘public transport priority corridors’ that follow all the main routes into Preston city centre, from Moss Side, Hutton. Warton, North West Preston, Broughton, Longridge, and Chorley as well as the route through Euxton / Buckshaw Village between Leyland and Chorley; and
- Improvements to rail stations at Preston, Leyland, and Chorley to make them more attractive and expand capacity, and a new ‘parkway’ station to serve North West Preston would be pursued at Cottam.

3.28 Four major road schemes are outlined within Masterplan which are to be delivery in the period to 2026. Two of these schemes – the A582 South Ribble Distributor and the completion of the Penwortham Bypass – have direct relevance to the Pickering’s Farm site due to their proximity to the proposed development and their connection to the site.

3.29 The A582 South Ribble Distributor proposals also include the Penwortham Way Dualling Scheme. These proposals involve capacity improvements along the existing A582 between Cuerden/Moss Side and Preston city centre to support delivery of the South of Penwortham/North of Farington strategic housing location and major housing sites at Croston Road and Moss Side.

3.30 The upgrading of the A582 to a dual carriageway will significantly increase road capacity with the improvements including alterations to, and closures at, existing junctions along the route. This work will also support the completion of the Penwortham Bypass and will link the two Western Distributor Roads in Preston and South Ribble with the construction of a new crossing of the River Ribble. A number of improvements have already been delivered with a planning application submitted for the dualling and cycle improvements along the section of the A582 known as Penwortham Way.

3.31 In addition to increased capacity, the proposed dualling of the A582 will also provide opportunities for bus priority measures to be developed along this route into Preston city centre. These works will also allow for public realm enhancements and improvements to prioritise and promote walking and cycling within the local area.

South Ribble Local Plan (2012 – 2026)

3.32 The South Ribble Local Plan was adopted in July 2015 and forms part of the Development Plan for South Ribble. The Local Plan sets out the vision for the borough and has been developed in line with Central Lancashire’s Core Strategy and includes references to their development management policies. It outlines the land use allocations for the local area and highlights land which has been protected for different uses including for housing, employment or play space. The Local Plan identifies five major site for development as follows;

- Pickering’s Farm;
- Moss Site Test Track at Leyland;
- Land between Heatherleigh and Moss Lane, Farington Moss;
- Cuerden Strategic Site; and,
- BAE Systems, Samlesbury.

3.33 As outlined previously, the proposed development site is allocated as the Pickering's Farm development within the Local Plan.

3.34 Chapter A of the plan outlines two core strategy objectives to deliver infrastructure necessary to meet other objectives including the delivery of homes, employment, and other economic targets. It outlines that the provision of infrastructure is an integral part of this plan and is essential for the sustainability of the town and villages within South Ribble and will assist in the delivery of new development.

3.35 For the purposes of the plan, infrastructure encompasses transport (roads and railways), utilities (water and energy), green infrastructure (parks and rivers), and social infrastructure (schools, medical centres, community centres). The plan outlines that sustainable development should provide new, well-planned, and accessible infrastructure upfront and make the optimum use of existing infrastructure.

3.36 The policies within the SRLP which are particularly relevant to this application are as follows:

- Policy A2 – Cross Borough Link Road;
- Policy C1 – Pickering's Farm, Penwortham; and,
- Policy F4 – Parking Standards

3.37 Policy A2 states that land should be protected from physical development for the delivery of the Cross Borough Link Road (CBLR). Part of the CBLR consists of a road constructed through the major development site at Pickering's Farm. At present 'The Cawsey Link' section has been constructed and is operational, opening up land for development.

3.38 The remaining section of the CBLR consists of a safeguarded corridor which runs from east to west through the proposed development site. The development proposals do not include the CBLR, however the development proposals will not prejudice the development of this link in the future.

3.39 Policy C1 outlines that planning permission for the site will only be granted for the development of the Pickering's Farm site subject to the submission of an agreed Masterplan for the comprehensive development of the site. The Local Plan outlines that the Masterplan should include the CBLR safeguarded land as well as a range of land uses to include residential, employment and commercial uses, green infrastructure, and community facilities.

3.40 Policy C1 goes on to state that the development of the site is dependent on the provision of infrastructure to ensure a sustainable development. An infrastructure delivery schedule is required and should be linked to the phases of development on the site.

3.41 Policy F4 outlines that all developments will be required to provide car parking and servicing space in accordance with the parking standards adopted by the Council which are outlined in Appendix 4 of the Local Plan. Parking requirements should be kept to the standards set out unless there are significant road safety or traffic management implications related to the development of the site.

3.42 The parking standards are broken down into three key areas with Area A referring to town centre locations, Area B referring to district of local centres and Area C referring to all other areas. The site is considered to be in Area C as it currently lies to the south/west of the existing built-up area. **Table 3.1** provides a summary of the parking standards for the land uses proposed for the site.

Table 3.1: South Ribble Parking Standards

<table>
<tr><th colspan="2">Land Use</th><th>Spaces per GFA (unless otherwise indicated)</th><th>Disabled Parking (up to 200 bays)</th><th>Bicycles</th><th>Motorcycles</th></tr>
<tr><td rowspan="3">Dwelling Houses</td><td>1bedroom</td><td>1 space per dwelling</td><td rowspan="3">Negotiated on a case by case basis</td><td>1 allocated
1 communal</td><td>-</td></tr>
<tr><td>2 – 3 bedrooms</td><td>2 spaces per dwelling</td><td>2 allocated
1 communal</td><td>-</td></tr>
<tr><td>4+ bedrooms</td><td>3 spaces per dwelling</td><td>4 allocated
2 communal</td><td>-</td></tr>
<tr><td rowspan="2">Non-Resi. Institutions</td><td>Schools</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Halls</td><td>1 per $5m^2$</td><td>3 bays or 6% of total</td><td>1 per $50m^2$ (min. 2)</td><td>1 per $125m^2$ (min 2)</td></tr>
<tr><td rowspan="2">Shops</td><td>Food Retail</td><td>1 per $14m^2$</td><td rowspan="2">3 bays or 6% of total</td><td>1 per $140m^2$ (min. 2)</td><td>1 per $350m^2$ (min. 2)</td></tr>
<tr><td>Non-food Retail</td><td>1 per $21m^2$</td><td>1 per $200m^2$ (min. 2)</td><td>1 per $500m^2$ (min. 2)</td></tr>
</table>

3.43 The SRLP states that the parking standards should be seen as a guide for developers and any variation from these standards should be support by evidence in the form of a Transport Assessment.

Penwortham Town Neighbourhood Development Plan 2016 – 2026

3.44 The Neighbourhood Plan refers to the Penwortham Bypass and the CBLR when describing the character of the area. As part of the Masterplan process for the Pickering's Farm site, the Town Council will be engaged in the preparation of this plan and will consider its relevance to the character of the proposals as set out in Policy 2.

3.45 Policy 2 outlines the requirements for new large scale residential development, and states that the phased delivery of allocated large scale residential sites will be supported by the Town Council.

3.46 Policy 7 relates to cycle and walking routes including the identification of a new route which will be safeguarded for a dedicated circular route for cyclists and walkers. The southern part of the cycle and walking route passes through the Pickering's Farm site along Bee Lane and Moss Lane. These routes will be preserved and enhanced as part of the development proposals. Proposals for development within the Neighbourhood Area that would prejudice the delivery of the route will be resisted.

4 Changes in Travel Behaviour and Guidance

Background

4.1 In addition to National and Local Planning Policy, it is also important to consider the emerging transport context and trends in travel behaviour when designing for new or expanded communities. These considerations should include, but are not limited to the following key areas:

- Climate emergency (including Council responses);
- Healthy living; and
- Accessibility.

4.2 This section of the report will consider each of these issues in turn with these considerations feeding into the subsequent traffic generation methodology. This section of the report will also outline the importance of moving away from the predict and provide model for transport planning to a vision and validate approach which prioritises active travel.

Climate

4.3 In 2019, SRBC declared a climate emergency and pledged to work to make the Borough carbon neutral by 2030. In order to tackle this, a Climate Emergency Working Group was formulated, and a Climate Change Strategy was developed. This strategy encompasses two broad themes – carbon reduction measures and resilience. A key objective in achieving this aim is to research best practice and look for innovative new approaches to reduce carbon emissions, carbon off setting and climate mitigation.

4.4 In terms of transport, the Climate Change Strategy outlines that the World Health Organisation has stated that the transport sector is the fastest growing contributor to climate emissions. The main drivers of global transport energy growth are land transport, mostly light-duty vehicles, such as cars, as well as freight transport. Transport's contribution to climate change includes long-lived carbon dioxide (CO_2) emissions with transport accounting for roughly 23% of carbon emissions in 2010.

4.5 In terms of resilience the Climate Change Strategy outlines that SRBC alongside the two other Central Lancashire Authorities – Preston City and Chorley – are in the process of undertaking a review of their development plans. SRBC highlight that this plan will aim to build resilience into the planning system by responding to the emerging climate emergency.

4.6 The Climate Strategy outlines that the emerging development plan will focus on providing connections across the Central Lancashire area which will improve access by prioritising sustainable transport including walking and cycling to link towns and city centres with their wider areas and other key destinations.

4.7 As part of the wider community response to the climate emergency, the Committee on Climate Change (CCC) wrote to the UK Government advising them on how the nation can emerge from the COVID-19 pandemic while also delivering a stronger and cleaner economy. As part of these recommendations the CCC outlined that investment should be made in low-carbon, resilient infrastructure such as improved broadband instead of new roads and make it easier for people to work remotely and encourage them to walk and cycle.

Healthy Living

4.8 The NPPF outlines that physical and mental health are a primary social aim of Government. In order to support strong, vibrant, and healthy communities it is imperative that new developments are well-designed and safe with accessible services and open spaces which reflect the current and future needs of communities. In providing sustainable access, new developments will assist in meeting the environmental objectives of the NPPF which include mitigating and adapting to climate change, including moving to a low carbon economy.

4.9 The Chartered Institution of Highways and Transport (CIHT) document *Better Planning, Better Transport, Better Places* published in August 2019, in collaboration with the Transport Planning Society (TPS) and the Royal Town Planning Institute (RPTI), focuses on providing guidance to create better places by better integrating planning and transport. This guidance has been designed to complement guidance from the Ministry of Housing, Community and Local Government. This guidance also provides practical solutions to tackling the challenge of climate change.

4.10 The Better Planning, Better Places document outlines that our quality of life depends on transport and easy access to jobs, shopping, leisure facilities, and services. An efficient and integrated planning and transport system is needed to not only support a strong and prosperous economy but to reduce carbon emissions.

4.11 Despite both the National Government and Local Councils/Boroughs declaring a climate emergency, the CIHT outline that car parking and traffic still dominate housing developments with sustainable access poor and sustainable approaches to transport relatively non-existent. This continues to occur due to the reliance of local councils and planners on the predict and provide models which focus on providing infrastructure to support access by car.

4.12 In conjunction with this, the Town and Country Planning Association (TCPA) have prepared a document *20-Minute Neighbourhoods: Creating Healthier, Active, Prosperous Community, An Introduction for Council Planners in England* which was published in March 2021. This guidance outlines that neighbourhoods are recognised as crucially important to our physical and mental health.

4.13 This guidance highlights the importance of creating neighbourhoods that make it easier for people to be more physically active by encouraging sustainable development which supports walking and cycling. The TCPA suggest that areas which discourage walking and have poor cycling infrastructure can negatively impact on an individual's mental and physical health.

4.14 With their most recent guidance on *Decarbonising Transport; A Better Greener Britain* published in July 2021, the DfT also supports the concept of the 20-minute neighbourhood, highlighting that through good design and proper consideration of the needs of our communities, people can be better connected, making communities more accessible, inclusive, safe, and attractive as well as promoting the principles of 20-minute neighbourhoods.

Accessibility

4.15 As outlined previously, contemporary local and national transport policy highlights that new developments should be located in places which are or can be made sustainable and provide access by active travel. Within this context, new developments should prioritise access by walking and cycling both within the site and to external destinations within the local area. By focusing on accessibility, it is possible to promote social cohesion, minimise the number and frequency of single car occupancy trips and limit the need to travel.

4.16 Homes England in collaboration with NHS England and NHS Improvement have updated their guidance *Building for a Healthy Life* which was published in July 2020. This guidance builds on lessons learned from the COVID-19 pandemic and acts as a design toolkit for neighbourhoods, streets, homes, and public spaces. It has been prepared to assist local communities in setting clear expectations of new development and focuses on three key themes:

- Providing integrated neighbourhoods which focus on natural connections; promote walking, cycling and public transport; provide access to facilities and services; and create homes for everyone;
- Create distinctive places which make the most of what is already built; create a memorable character; develop well defined streets and spaces; and make it easy to find your way around; and,
- Providing streets for all by creating healthy streets which provide cycling and car parking; make use of green and blue infrastructure; and, consider the back of pavement, front of home interface.

4.17 In considering accessibility it is important to consider accessibility across the day and not just focus on the typical commuter peak periods given the changes in travel behaviour which have occurred in response to the COVID-19 pandemic. The most prevalent reason for accessibility is education, followed by leisure and then travel to work.

Predict and Provide or Vision and Validate

4.18 Within this context it is important to consider the effectiveness of the predict and provide (P&P) model of transport planning in addressing the aims and objectives of current Government policy and guidance. These policies place a high importance on sustainable development with no expression of policy which prioritises the convenience of car commuters. The P&P approach has been abandoned as it does not represent real life and instead of promoting sustainable development results in bigger roads and junctions which effectively work to increase traffic volumes.

4.19 The CREATE project explores how cities have responded to the challenges of growing car ownership and use, and the associated increases in traffic congestion. It highlights that a general rule of traffic is that in congested networks, increasing road capacity only works to increase car volumes and in turn carbon emissions. Whereas reducing road capacities has the opposite effect and reduces car volumes and emissions as the benefits of driving decrease with more congestion.

4.20 In response to this move away from the P&P approach, the Vision and Validate (V&V) approach has been adopted. This approach looks at defining what one wants to see and designing to achieve that. In traffic terms this may mean not providing any more road capacity and using capacity as a tool to limit peak demands.

4.21 The DfT guidance on Decarbonising Transport supports the move away from the P&P approach highlighting that there is a need to move away from transport planning based on predicting future demand to provide capacity ('predict and provide') to planning that sets an outcome communities want to achieve and provides the transport solutions to deliver those outcomes (sometimes referred to as 'vision and validate')."

4.22 This guidance suggests that historically, opposition to housebuilding has occurred as a result of traffic issues within local areas. By providing development(s) which are planned to minimise car use, promote sustainable transport choices, and provide access to existing public transport infrastructure these developments might be more publicly acceptable.

4.23 The CIHT guidance Better Places, Better Planning suggests that current planning practice is not delivering the best outcomes and far too many examples still exist where the long since discredited approach of 'predict and provide' is used to the detriment of planning better places.

4.24 This guidance outlines that in order to create better places for people and encourage healthy living it is necessary to fully abandon the predict and provide models of transport planning. Instead, new developments should be assessed against health and wellbeing, lifestyle, and environmental criteria. In moving away from the predict and provide model it makes it possible to invest time and resources in active travel instead of providing road-based infrastructure which encourages driving and discourages walking, cycling and other forms of active travel.

4.25 The TCPA's document *Garden City Standards – Guide 13; Sustainable Transport* published in September 2020 outlines that new developments should have a goal of enabling at least 60% of trips to be made by non-car modes of transport. It goes on to highlight that is it necessary to take a 'vision and validate' approach, not predict and provide, which historically has meant building more road for more cars".

4.26 TRICS outlines a similar theme in their '*TRICS Guidance Note: On the Practical Implementation of the Decide and Provide Approach*' published in February 2021. This note advises that if we continue to reproduce past transport solutions based on previous travel behaviour, it is inevitable that transport planning will continue to seek to provide infrastructure that meets previously predicted needs, rather than meeting, and indeed shaping, the transport needs of the future.

4.27 As outlined in the CREATE project, the TRICS guidance note goes on to state that by overproviding highway capacity, developments can induce motorised transportation and in turn exacerbate efforts to combat climate change and reduce vehicular traffic. This is an oft occurring theme in research and guidance referring to a fundamental law of traffic, which underpins the Vision & Validate approach, which is that in an increasingly busy road network, the volume of traffic is increasingly a function of the availability of road space, so that increasing road space induces traffic, and reducing road space reduces traffic.

Summary

4.28 The way to maximise the opportunities of the changes in travel behaviour and respond to the challenges of climate change is to design with accessibility in mind and seek opportunities to maximise walking, cycling and public transport within the local area. It is imperative that new developments are designed with accessibility at the forefront, and where movement occurs to maximise active travel first.

4.29 For this reason, it is important to move away from the predict and provide model of transport planning and move towards a vision and validate approach. This will be even more important as we emerge from the COVID-19 pandemic and begin to consider the impact this has had on people's attitudes and opportunities.

4.30 By adopting the policy compliant and strong guidance for a vision and validate approach to transport planning, developments are able to focus on providing best designs for climate and health, promoting green infrastructure which supports active travel instead of primarily focusing on providing more road space which does not support the goals of National and Local Planning Policy.

5 Proposed Development

Development Scale and Overview

5.1 The proposed development seeks to provide 1,100 residential dwellings with complementary infrastructure and facilities including a primary school, local centre (including mobility hub and third place working environment), public open space and a network of active travel connections both within the proposed development site and connecting to existing residential communities to the east, north and west.

5.2 It provides active travel connections, which include a vehicular access on Penwortham Way and Bee Lane while retaining the existing network of rural lanes and PRoW which provide connections within the proposed development. The proposals provide excellent permeability to existing services and amenities surrounding the proposed development which reinforce the strategic and local benefits.

The Transport and Mobility Strategy

5.3 The Transport Strategy comprises four key stages intended to create a socially inclusive community which support national and local planning policy by encouraging non-motorised travel modes and prioritising walking and cycling followed by the use of bus/rail. In order to achieve this, the development proposes a comprehensive package of sustainable transportation measures. The transport and mobility strategy is focused on:

- **Design:** creating communities, where local living, public interaction, outdoor and indoor, is the norm and where it is not an automatic reaction when leaving home to get into a car. The site is well place to take advantage of the proximity of a range of day-to-day facilities both within the site and available in neighbouring communities.
- **Choice:** providing the infrastructure and facilities to minimise reliance on any single option of transport. This would assist in widening social inclusion and makes car use more of a choice and less of a necessity. Increased choice provides the opportunity to change behaviour. The proposed package of sustainable transportation measures seeks to encourage behavioural change in travel.
- **Behaviour:** educating people in the options and consequences for mobility. It brings together awareness, health, environment, and personal convenience. Travel Planning and Personalised Travel Planning can be significant factors in encouraging behavioural change and a Framework Travel Plan accompanies this report.
- **Network Management:** managing the road network in accordance with national and local policy with walking at the top followed by cycling, public transport and finally car. Car travel is the lowest capacity network in term of space occupied per persona and also occupies the lowest priority in the user hierarchy. This means prioritising the reliability and speed of bus and cycle movements over that of cars in the commuter peaks. As such, the objective of the Transport Strategy is not to follow a predict and provide approach to delivering more road capacity to the detriment of investment for other modes of travel choice.

Active Travel Access

5.4 With regards to the existing lanes, many of which are already adopted highway or PRoW, there is an opportunity to provide an improved active travel network as part of the proposed development which respects the local setting and seeks to retain much of the rural character.

5.5 This can be achieved in part by ensuring there is no significant increase in motor vehicular traffic using the majority of the existing lanes but also through a series of targeted route improvements, both physical (i.e. surface, widths and security) and where possible relating to legal status (i.e. footpaths upgraded to bridleways).

5.6 There is then the opportunity to supplement this existing network with new active travel facilities constructed as part of the proposed development making it more convenient to travel by active travel modes than by private car.

5.7 Pedestrian and cycle access is currently provided via existing adopted highway at Bee Lane and Flag Lane. These access points will be retained as existing, and promoted primarily for active travel use only (i.e. no significant increase in motor vehicle traffic). These routes are currently lightly trafficked with low vehicle speeds, no recorded accidents and are routes that many active travel users already choose to use with minimal conflict. It should be noted that although predominantly being promoted for active travel, existing use of these links to gain access to existing properties will be retained.

5.8 In addition to the existing active travel links at Bee Lane and Flag Lane to the east, there are other existing active travel connections to and from existing communities in the west and north. This includes the following which will be retained and improved (where required and within the application sites):

- Adopted highway connection retained linking to the residential area of Cloughfold providing active travel access to the west of the site including facilities in Penwortham;
- Part of Footpath 7-9-FP43 linking to the adopted highway at Cloughfold to provide improved surfacing, lighting and upgrade to bridleway status;
- Part of Footpath 7-9-FP42 connection towards Kingsfold Drive to the north to provide improved width, surfacing, lighting and upgraded to bridleway status to facilitate active travel links to the existing Kingsfold community;
- Footpath 7-9-FP46 connection retained between Bramble Court and Moss Lane to facilitate pedestrian links to the Kingsfold community;
- Footpath 7-9-FP49 connection retained between Queens Court Avenue and Bee Lane to facilitate pedestrian links to the Kingsfold community; and
- Footpath 7-9-FP52 connection retained between Sumpter Croft and Bee Lane to facilitate pedestrian links to the Kingsfold community.

5.9 For many of the links identified, the surface is already of a reasonable condition to be able to promote continued use for active travel, and many of the routes already provide a width in excess of 2.5 metres. Where possible, surfacing, lighting and maintenance can and will be carried out to these routes to bring each route to a good quality and consistent standard.

Proposed Vehicular Site Access

5.10 It is proposed to provide vehicular access to the proposed development at two locations; Penwortham Way and Bee Lane. Flag Lane also provides vehicular access to existing properties that will be encompassed within the new community.

Penwortham Way

5.11 The primary vehicular access will be provided via a new traffic signal-controlled junction on Penwortham Way, as presented in **Plan 1**. This will provide access via an internal residential estate road to the majority of residential dwellings (i.e. 1,060 dwellings), the school and the local centre.

5.12 Two lanes are provided on the site access arm to separate right and left turning movements. In addition, two ahead lanes are provided on the northern and southern arms of Penwortham Way, plus a dedicated left and right turning lane to facilitate access into the site whilst minimising potential impacts on general north-south movements along the corridor.

5.13 At present, there are no pedestrian footways along Penwortham Way and given the previously described network of active travel links provide more attractive routes to local communities in the west, north and east, it is considered that there would be no requirement for pedestrians and cyclists to use the new junction on Penwortham Way.

5.14 Despite this, it is acknowledged that there is potential for a highway improvement scheme promoted by LCC which would introduce a new shared foot/cycle way along the eastern side of the corridor providing a continuous route between junctions at Chain House Lane to the south, and Pope Lane to the north. As such, the design of the site access junction incorporates the option (see **Plan 2**) to include foot/cycle ways leading into the proposed development, but also controlled crossing facilities to allow for the movement of any users heading north or south.

5.15 Overall, there is flexibility within the design to integrate with the existing highway layout along Penwortham Way, but also to integrate with any future improvement scheme promoted by LCC (subject to their own planning permission).

Bee Lane

5.16 A vehicular access is to be provided from the existing adopted highway at Bee Lane. This will take the form of a simple priority junction, as shown in **Plan 3**, providing access for up to 40 residential dwellings only.

5.17 The simple priority junction will provide a width of 5.5 metres with the option to provide 2 metres footways around each radii. Visibility splays of 2.4 metres by 43 metres can be provided in both directions, but it should be noted that vehicle flows and speeds have been observed to be low in the vicinity of this proposed access.

5.18 Immediately to the east of the proposed site access on Bee Lane is a bridge over the West Coast Mainline. The width between the parapets is approximately 6.5 metres and the route at this point is straight with good forward visibility. The predicted use of this bridge includes pedestrians, cyclists, micro-mobility users, cars and delivery vehicles, all in relatively low volumes. Given this, the observed low vehicle speeds at present, and that all users have good visibility of each other, the design assumes a pedestrian prioritised street arrangement, where vehicles are perceived as 'guests' in this environment.

5.19 Further east of the bridge over the West Coast Mainline is the Leyland Road/Bee Lane roundabout. Footways are provided on approach to the roundabout with splitter islands and dropped kerbs providing the opportunity for pedestrians to cross Leyland Road. As part of the proposals to provide vehicular access for up to 40 dwellings only, but also to improve connections for active travel (as previously described), options are under investigation for potential desirable improvements to east-west crossing infrastructure at this location.

Internal Site Layout and Car Parking

5.20 A new vehicular site access is proposed on Penwortham Way in the form of a traffic signal-controlled junction. This can be designed to be sufficient for the development demand whilst also acknowledging the County Council's desire to improve the capacity of the Penwortham Way corridor in the future (subject to their own planning application). The secondary vehicular site access proposed using Bee Lane will serve a small parcel of development in the north east of the site only. There would be no internal vehicular connection between the new access on Penwortham Way and the existing access on Bee Lane.

5.21 The internal road network will provide a suitable hierarchy acknowledging national design criteria to promote enhanced streets, informal streets and pedestrian-priority streets with appropriate active frontage in parts to reinforce a low-speed residential environment. The overarching concept which underpins the access and movement strategy in that planning for people creates places for people, in contrast to planning for cars which has always historically resulted in places dominated by cars.

5.22 As previously noted, there will be opportunities to travel between the main part of the site to the west and the small parcel to the north east by active travel modes. This will include use of the existing lanes as previously described, but also via a new residential active travel network. Each of the new pedestrian and cycle routes within the site will be lit, surfaced, be generally overlooked and be of high quality to ensure access on foot and by cycle is maximised. There will also be numerous opportunities for the new active travel infrastructure to connect with the existing lanes thereby providing an interconnected network

5.23 Existing PRoW will be retained along existing alignments (i.e. Footpath 7-9-FP50 along Bee Lane, Footpath 7-9-FP57 along Nib Lane and Footpath 7-9-FP54 along the southern section of Moss Lane) with consideration given to upgrading routes to bridleway status to be determined within future reserved matters detailed planning applications as the site is brought forward. In the few instances where the new residential network is required to cross the existing lanes, careful consideration will be given to maintaining the priority of the active travel routes, with infrastructure provided to prevent vehicular traffic generated by the development from accessing the existing lanes.

5.24 It is noted that the proposed development can facilitate delivery of Penwortham Town Council's vision for a Penwortham Cycle Route along Bee Lane, as noted in their Neighbourhood Plan.

5.25 The internal road network constructed to serve the initial 1,100 residential dwellings will be suitable to form the initial part of a future CBLR, should a full link be deemed desirable by the Council in the future. Whilst an east-west link is not required to be delivered for the proposed development (or indeed the site allocation area), and local policy only requires land to be protected from development for a CBLR, the development will actually be constructing a significant length of a road which could become the CBLR through land under the developer's control.

5.26 Full parking provision for the proposed development will be determined at the reserved matter stage, however the scheme will be designed based on the requirement for reducing off-site impacts of the development. The parking provision will be prepared in accordance with local guidance. Electric vehicle charging points will also be provided which will encourage the use of more environmentally friendly vehicles.

5.27 The internal road network will allow refuse and delivery vehicles to enter, turn and exit in forward gear.

Shared Travel

5.28 Early discussions have been coordinated with local bus operators regarding how best to service the proposed development so that sustainable modes can be actively promoted. It should be noted that there is a desire from commercial operators to provide bus services within the development.

5.29 Discussions to date have sought to explore the options available to provide improved access to public transport services. This has included the potential for improvements to existing services, diversion or extension of existing services and provision of new services.

5.30 Following early discussions, it is considered that the provision of a new bus service would be preferable entering and exiting the site via Penwortham Way and providing a connection to Preston city centre and Preston Railway Station. The provision of a new bus service will improve the sustainability and accessibility of the proposed development by ensuring residents have a quality public transport option available which provides them with a link to key services and local facilities within South Ribble and the wider area (i.e. Preston). Based on information provided by the operator, it is envisaged that two buses would operate a fast and direct service every half hour between the site and Preston city centre (including Preston Railway Station).

5.31 Indicative bus routes within the site have been considered allowing for access via Penwortham Way heading towards the new local centre and mobility hub. Space will be provided for buses to turn and exit via Penwortham Way for the initial 1,100 dwellings, but it should be noted that there is flexibility for the route to be extended thereby providing an internal loop around the wider masterplan area in due course.

5.32 The internal layout provides suitable carriageway widths along potential routes to accommodate the movement of buses, with bus stops and other associated infrastructure (i.e. raised kerbs, shelters, seating and timetable information) provided ensuring that each dwelling is within easy reach.

5.33 Funding has been allocated to support the introduction of a new bus service with discussion ongoing regarding the implementation strategy, linked to a phased build programme. It should also be noted that existing services available on Leyland Road and Kingsfold Drive are an option for many residents.

Mobility Hub and MaaS

5.34 Mobility as a Service (MaaS) is a concept of combining services from public and private transport providers in one place which allows users to create and manage trips. MaaS for the development will be delivered by improving public transport and active travel opportunities, as well as making cycling and car sharing options thoroughly available at a mobility hub within the local centre.

5.35 The mobility hub within the site will provide a focal point in the primary movement network, allowing for the seamless integration of different modes of transport, multimodal supportive infrastructure, and placemaking strategies to create an activity centre that can maximise first and last mile connectivity. It will support local living, low-car lifestyles and the reallocation of space from roads and carparking to housing and public realm, and have the potential to contribute significantly to decarbonising transport.

5.36 At this stage, it is considered that the mobility hub would include cycle hire, e-scooters, carshare, EV charging, shared / DRT transport, WiFi, and be linked to active travel routes. It will be a micro-consolidation centre for domestic deliveries. It will be administered by a community concierge team, the role of which will include all things community and mobility, including travel planning, bespoke residential travel planning, administering the mobility hub elements, and being a central part of the community. There will be a shared third place working environment and a community space. Secondary mobility hubs will provide unstaffed facilities including cycle and vehicle sharing.

5.37 Temporary mobility hubs will be provided from day one in the vicinity of residential sales centres within the site. This allows the principles to be adopted from day one, with the permanent location for the mobility hub being within the local centre delivered as part of a phased construction programme.

5.38 The provision of a mobility hub from day one will not only assist with the promotion of local living, but can help to fill temporary gaps in the public transport network in a more cost effective way, linked to a phased delivery programme.

Travel Plan

5.39 The developer is committed to providing a comprehensive Travel Plan for the site which will include Personalised Travel Planning (PTP). A community concierge will be provided for the site. The function of the community concierge includes those of the traditional Travel Plan Co-ordinator with additional duties such as PTP and offering an active role in bike sharing, car clubs and carpooling.

Construction

5.40 The majority of construction related activity will be coordinated via the new access on Penwortham Way. There may however be a need for some construction activity to be coordinated via Bee Lane for the small parcel of residential development in the north eastern part of the site.

5.41 The impact of construction vehicles will be controlled via an agreed Construction Environmental Management Plan (CEMP). The CEMP will set out how construction traffic will be managed on the local highway network during the anticipated construction period. The purpose of a CEMP is to ensure that the effect of construction traffic is mitigated against, particularly in relation to local residents and any air quality issues. The CEMP will control the timings, routing and volume of traffic entering/leaving the site during this period.

6 Trip Generation and Distribution

Key Principles

6.1 The proposed development comprises the delivery of up to 1,100 residential units, however it is noted that the site allocation comprises up to 1,350 residential units as part of the Local Plan. The trip generation and trip distribution exercise has therefore considered a development scale of 1,100 units followed by a consideration of the 1,350 units with this assessment also considering the introduction of a school.

6.2 This is important to note, since a number of trips will be internalised within the local community, which includes the existing communities into which this development sits, as well as by the proposed development's provision of retail, third place working environment and educational facilities. This maximises accessibility and local living, the primary aims when considering climate and health. It also minimises unfettered demand on the local highway network at busy times compared with ad hoc development growth in smaller parcels.

6.3 The trip demand exercise is necessarily an iterative exercise under the policy compliant Vision & Validate approach, and is a function of the availability of road space, as is the volume of background traffic. We have started this exercise with a forecast for movement in a historically 'normal' community and unfettered by reaction to convenience or inconvenience on the highway network.

6.4 For this exercise any land use apart from the residential land-use have been assumed to be ancillary land-uses with no additional traffic demand assumed on the wider road network.

6.5 The NPPF states that the likely impacts of development should be assessed. Therefore, this section of the TA provides a forecast of the initial unfettered more likely trip generation, considering trips by journey purpose (education, employment, leisure) and the potential for internalisation.

Trip Generation Methodology

Person Trip Rates

6.6 To begin, understanding the potential demand from the proposed development is considered in terms of the number of person trips generated by the site. To achieve this, the TRICS database has been interrogated, selecting the appropriate parameters as below;

- Main Land Use – 03 Residential, Sub Land Use – A Houses Privately Owned,
- Number of dwellings 100 to 1820,
- Excluded Greater London and Ireland,
- Selected Edge of Town and Residential Zone locations.

6.7 The person trip rates, and associated trips are presented in **Table 6.1** below. The full TRICS output files are provided as **Appendix A.**

Table 6.1: Average Total Person Trip Rates and Trips

Time	Trip Rate (per dwelling)			Trips (1,100 dwellings)		
	Arrive	Depart	Two-way	Arrive	Depart	Two-way
07:00 - 08:00	0.106	0.496	0.602	117	546	662
08:00 - 09:00	0.210	0.767	0.977	231	844	1075
09:00 - 10:00	0.208	0.281	0.489	229	309	538
10:00 - 11:00	0.177	0.235	0.412	195	259	453
11:00 - 12:00	0.183	0.208	0.391	201	229	430
12:00 - 13:00	0.226	0.215	0.441	249	237	485
13:00 - 14:00	0.225	0.213	0.438	248	234	482
14:00 - 15:00	0.259	0.270	0.529	285	297	582
15:00 - 16:00	0.512	0.281	0.793	563	309	872
16:00 - 17:00	0.515	0.264	0.779	567	290	857
17:00 - 18:00	0.582	0.252	0.834	640	277	917
18:00 - 19:00	0.531	0.292	0.823	584	321	905

6.8 To understand the mode split of these trips and in turn the number of vehicle trips generated by the site, consideration has been given to the journey purpose of trips from residential areas using the National Travel Survey (NTS). The NTS consists of face-to-face interviews and a seven day self-completed written travel diary with database number 0502 providing a review of the trip start time by trip purpose for England. **Table 6.2** provides a summary of this information with **Appendix B** providing the raw NTS data. It is noted that this does not take into account the pre COVID-19 changing trends, and the acceleration and firm expectation of these trends post COVID-19, which is discussed in subsequent sections.

Table 6.2: Trips by Journey Purpose – Commuting, Education, Recreation / Leisure.

Time	Commuting	Education	Recreation/Leisure
07:00 - 08:00	53%	20%	27%
08:00 - 09:00	23%	51%	26%
09:00 - 10:00	16%	10%	74%
10:00 - 11:00	9%	2%	89%
11:00 - 12:00	9%	3%	88%
12:00 - 13:00	11%	4%	85%
13:00 - 14:00	15%	3%	82%
14:00 - 15:00	14%	15%	72%
15:00 - 16:00	9%	47%	44%
16:00 - 17:00	26%	11%	63%
17:00 - 18:00	36%	5%	59%
18:00 - 19:00	24%	2%	74%

6.9 The total number of person trips summarised in **Table 6.1** broken down by the journey purpose summarised in **Table 6.2,** results in a breakdown of trips by journey purposes as summarised in **Table 6.3.**

Table 6.3: Total Trips by Journey Purpose

Time	Commuting		Education		Recreation/Leisure	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	62	291	23	108	31	147
08:00 - 09:00	53	193	119	434	59	217
09:00 - 10:00	36	49	23	31	170	229
10:00 - 11:00	18	24	4	5	173	230
11:00 - 12:00	18	21	7	8	176	200
12:00 - 13:00	28	26	10	10	211	200
13:00 - 14:00	36	34	8	8	203	192
14:00 - 15:00	39	40	42	44	204	213
15:00 - 16:00	53	29	264	145	245	135
16:00 - 17:00	148	76	63	32	356	182
17:00 - 18:00	228	99	33	14	380	164
18:00 - 19:00	139	76	11	6	434	239

6.10 The following paragraphs outline how the person trip rates presented in **Table 6.3** have been assigned a mode split to consider the vehicle trip generation of the development proposals.

Commuting Trips

6.11 For commuting trips, the mode split exercise considered how people travelled to work using the 2011 Census database. This exercise considered how people travelled to work form the South Ribble 006 Middle Super Output Area (MSOA) using the Journey to Work profile. **Figure 6.1** illustrates the area covered by the South Ribble 006 MSOA which includes the development site and the residential areas to the north and east of the site.

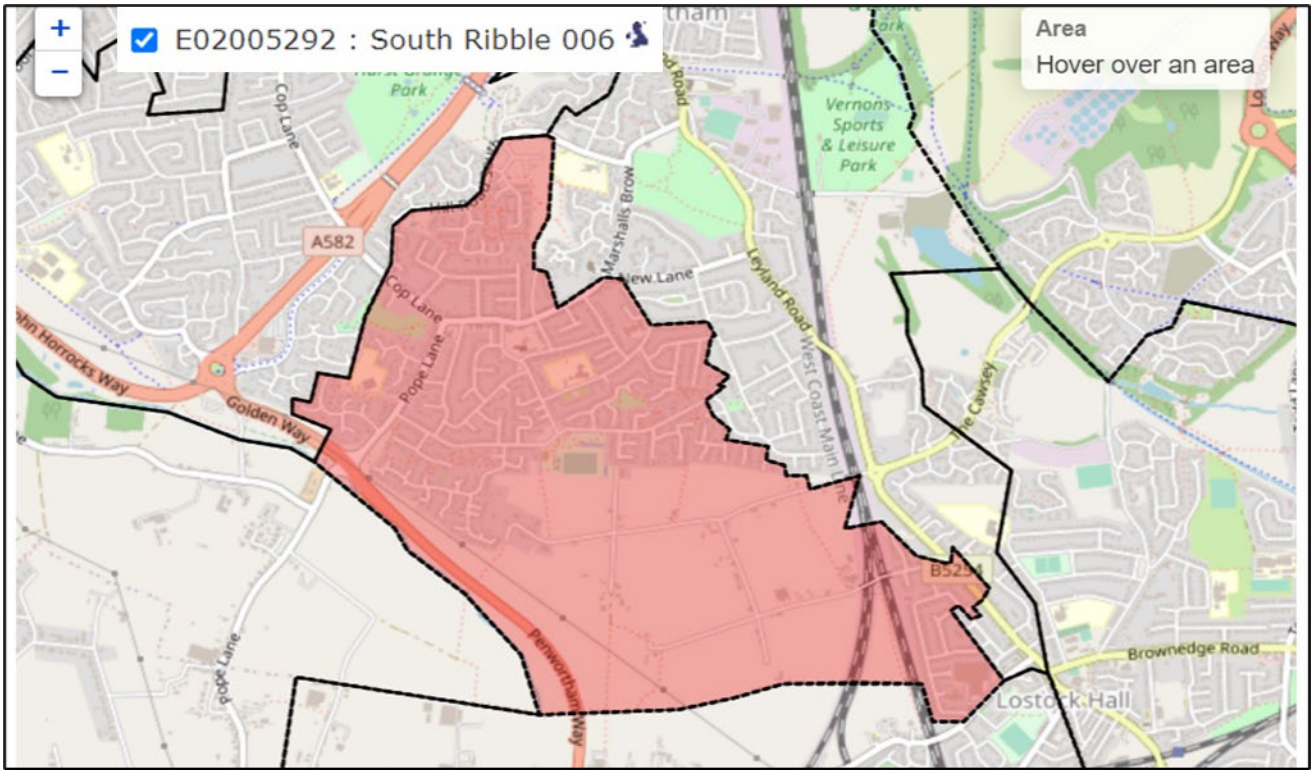


Figure 6.1: South Ribble 006 MSOA Boundary **(source: Office for National Statistics)**

6.12 Due to location of the site and the number of trips travelling from the site to Preston and areas surrounding the site where active travel modes are likely to be more common, two mode split profiles were considered. This exercise considered a mode split between MSOA's within a 5km catchment of the site and the MSOA's outside a 5km catchment for the site. **Table 6.4** provides a summary of the mode split for commuting trips.

Table 6.4: Commuting Trips Mode Split

Method of Travel to Work	Within 5km Radius	Outside 5km Radius
Underground, metro, light rail, tram	0%	0%
Train	0%	1%
Bus, minibus, or coach	16%	11%
Taxi	0%	0%
Motorcycle, scooter or moped	1%	1%
Driving a car or van	61%	70%
Passenger in a car or van	8%	7%
Bicycle	6%	4%

6.13 To consider the split between trips conducted within 5km of the site and trips travelling outside the 5km catchment, the number of trips to each MSOA from the South Ribble 006 MSOA were considered. This process revealed that there were 1,652 commuting trips from the South Ribble 006 MSOA to locations within a 60-minute drive-time from the site. Of these trips 770 were to MSOA's within 5km of the site which equates to 47%. There were 882 trips to MSOAs outside the 5km catchment of the site which equates to 53%.

6.14 Applying the mode split in **Table 6.4** to the commuting trips presented in **Table 6.3** results in a trip demand as summarised in **Table 6.5.** An internalisation factor of 5% was also applied to the person trips to take account of the trips occurring within the site and people working from home.

Table 6.5: Commuting Multi-modal Trip Demand

Time	Drive		Passenger/Taxi		Walk		Cycle		Public Transport	
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	39	185	4	20	4	18	3	14	24	43
08:00 - 09:00	34	123	4	14	3	12	2	9	17	29
09:00 - 10:00	23	31	3	3	2	3	2	2	6	9
10:00 - 11:00	11	15	1	2	1	1	1	1	3	4
11:00 - 12:00	12	13	1	1	1	1	1	1	3	4
12:00 - 13:00	18	17	2	2	2	2	1	1	4	5
13:00 - 14:00	23	22	3	2	2	2	2	2	5	7
14:00 - 15:00	25	26	3	3	2	2	2	2	5	8
15:00 - 16:00	34	19	4	2	3	2	2	1	5	8
16:00 - 17:00	94	48	10	5	9	5	7	4	14	20
17:00 - 18:00	144	63	16	7	14	6	11	5	21	29
18:00 - 19:00	88	48	10	5	9	5	6	4	14	20

Education Trips

6.15 For education trips, the mode split of trips was considered using the NTS database 0614 which provides an education mode split by journey distance for students aged 5–10 and students aged 11–16. A review of the schools near the site indicated that there are 3 primary schools within 1 mile of the site and 2 primary schools and 5 high schools outside 1 mile of the site. Therefore, this exercise considered two mode profiles, as follows:

- Mode split for 5 – 10 year olds within 1 mile; and
- Mode split for 5 – 16 year olde outside 1 mile but within 5 miles.

6.16 **Table 6.6** provides a summary of the mode split for education trips.

Table 6.6: Education Mode Split

Method of Travel to Education	Within 1 mile	Outside 1 mile
Walk	80%	20%
Bicycle	1%	4%
Car / van	18%	56%
Private bus	0%	0%
Local bus	1%	19%
Surface rail	0%	0%
Other transport	0%	2%

6.17 An even split of trips between the schools was considered the most appropriate way to divide the person trips between those occurring to schools within 1 mile and outside 1 mile of the site. This exercise assigns 30% of education trips to being within 1 mile of the site and 70% of trips to schools outside the 1 mile catchment. The resultant trips are presented in **Table 6.7** for trips within 1 mile and **Table 6.8** for trips outside 1 mile.

Table 6.7: Education Multi-modal Trip Demand (Schools within 1 mile of the Site)

Time	Drive		Walk		Cycle		Public Transport	
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	1	6	6	26	0	0	0	0
08:00 - 09:00	7	24	29	105	0	1	0	1
09:00 - 10:00	1	2	5	7	0	0	0	0
10:00 - 11:00	0	0	1	1	0	0	0	0
11:00 - 12:00	0	0	2	2	0	0	0	0
12:00 - 13:00	1	1	2	2	0	0	0	0
13:00 - 14:00	0	0	2	2	0	0	0	0
14:00 - 15:00	2	2	10	11	0	0	0	0
15:00 - 16:00	15	8	64	35	0	0	1	0
16:00 - 17:00	4	2	15	8	0	0	0	0
17:00 - 18:00	2	1	8	3	0	0	0	0
18:00 - 19:00	1	0	3	2	0	0	0	0

Table 6.8: Education Multi-model Trip Demand (Schools outside 1 mile of the Site)

Time	Drive		Walk		Cycle		Public Transport	
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	9	42	3	15	1	3	3	16
08:00 - 09:00	46	169	16	60	3	11	3	64
09:00 - 10:00	9	12	3	4	1	1	3	5
10:00 - 11:00	2	2	1	1	0	0	3	1
11:00 - 12:00	3	3	1	1	0	0	3	1
12:00 - 13:00	4	4	1	1	0	0	3	1
13:00 - 14:00	3	3	1	1	0	0	3	1
14:00 - 15:00	17	17	6	6	1	1	3	6
15:00 - 16:00	103	57	37	20	6	4	3	21
16:00 - 17:00	25	13	9	4	2	1	3	5
17:00 - 18:00	13	6	5	2	1	0	3	2
18:00 - 19:00	4	2	2	1	0	0	3	1

6.18 The proposed development includes a two-form primary school, however as the school may not be delivered until a later development phase, all trips were considered external to the site with no internalisation factor applied for the 1,100 dwelling scenario. It should also be noted that there are opportunities to increase the active travel mode split for journeys to school as part of the proposed development, thereby significantly reducing the number of car trips.

Recreation / Leisure Trips

6.19 The NTS data demonstrates that in the AM peak 26% of journeys are undertaken for the purposes of leisure / recreation (i.e. walking the dog, visiting friends, day to day shopping such as for a pint of milk, other shopping, personal business, holiday, day trips etc). This number increases to 85% in the interpeak period and 59% in the PM peak period. The proposals include for a Local Centre, including retail and community facilities and the scale of development in terms of dwellings, will ensure a number of trips are internalised within the site.

6.20 For the purpose of assessment, a judgement has been made that 50% of leisure/recreation trips are internal trips which remain within the site and 50% are external trips which travel off site. This assessment focuses on the 50% of trips which leave the site to access leisure / recreation opportunities offsite, including the areas of Kingsfold and Tardy Gate.

6.21 As there is no NTS database which provide mode splits for leisure / recreation trips we have applied the same mode split used to distribute commuting trips as summarised in **Table 6.4.** As a large proportion of trips are considered internal to the site the mode split for trips greater then 5km has been utilised. A breakdown of the external leisure / recreation trips is provided in **Table 6.9.**

Table 6.9: Recreation/Leisure Multi-modal Trip Demand

Time	Drive		Passenger/Taxi		Walk		Cycle		Public Transport	
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	5	26	31	1	3	3	0	2	2	0
08:00 - 09:00	10	38	48	1	4	5	1	3	3	1
09:00 - 10:00	30	40	70	3	4	7	2	3	5	2
10:00 - 11:00	30	40	70	3	4	7	2	3	5	2
11:00 - 12:00	31	35	66	3	4	7	2	3	5	2
12:00 - 13:00	37	35	72	4	4	7	3	3	5	2
13:00 - 14:00	36	34	69	4	3	7	3	2	5	2
14:00 - 15:00	36	37	73	4	4	7	3	3	5	2
15:00 - 16:00	43	24	67	4	2	7	3	2	5	2
16:00 - 17:00	62	32	94	6	3	9	4	2	7	4
17:00 - 18:00	66	29	95	7	3	10	5	2	7	4
18:00 - 19:00	76	42	118	8	4	12	5	3	8	4

Trip Distribution Methodology

6.22 The development trips have been assigned to the local road network using a similar pattern to the trip generation exercise with the distribution split between commuting, education, and recreation/leisure. The process to arrive at each distribution is outlined in the following paragraphs.

6.23 In all scenarios, trips have been assigned to the model zones contained within the micro-simulation model which was provided by Vectos MicroSim (discussed further in subsequent sections). To assist with the distribution exercise, the model zones have been divided into five main categories as follows:

- Zones 0 – 199; consist of mainly residential land uses;
- Zones 200 – 299; consist of mixed land uses;
- Zones 300 – 399; consist of education land uses;
- Zones 400 – 499; consist of employment land uses; and
- Zones 900 – 999; are model entry and exit zones.

Commuting Distribution

6.24 The trip distribution exercise for commuting trips has been undertaken using Census 2011 Journey to Work (JTW) data, the model zone data provided by Vectos MicroSim, MapInfo Pro version 2019.3 and Routefinder version 6.03. The JTW destination data has been extracted for those living within the South Ribble 006 MSOA. The JTW data details the destination MSOAs form which individuals travel to access employment from the South Ribble 006 MSOA. The base data is presented in **Appendix C.**

6.25 Initially, the JTW data was extracted from the NOMIS website for all MSOAs within England that people who currently living within the South Ribble 006 MSOA travel to for work. This exercise considered car drivers only and did not include all modes of transport. Each MSOA was then assigned an X and Y coordinate so that it could be plotted geographically within MapInfo.

6.26 Once imported into MapInfo, Routefinder software has been utilised to provide the most direct routes to/from the South Ribble 006 MSOA to all MSOAs within a 60-minute drive time of the site. This catchment represents a reasonable maximum journey time for commuting trips. The Routefinder software considers the most direct route based on time and distance and also uses turn restrictions. This exercise considered trips to the site and trips from the site during the morning, inter-peak, and evening peak periods. While there were minor changes in the routes for journeys to and from the site there were no changes to the routes taken based on the time of day.

6.27 An initial distribution exercise was then conducted assigning trips leaving the model study area to the 900 entry/exit zones. This distribution is presented in **Table 6.10** with the base data provided in **Appendix C.**

Table 6.10: Commuting Trip Distribution (Zones 900 – 999)

Zone	Arrive		Depart	
	%	12 hour Trips	%	12 Hour Trips
900	10.955%	60	10.047%	61
901	0.545%	3	0.545%	3
902	3.389%	18	3.389%	21
903	0.000%	0	0.000%	0
904	0.424%	2	0.424%	3
905	0.000%	0	0.000%	0
906	8.352%	45	9.139%	56
907	2.118%	12	4.237%	26
908	1.997%	11	0.000%	0
909	28.265%	154	39.341%	239
910	9.502%	52	0.000%	0
911	1.211%	7	1.211%	7
912	1.816%	10	1.029%	6
913	0.000%	0	0.787%	5
914	0.000%	0	0.000%	0
915	12.166%	66	10.592%	64

6.28 Following this initial distribution exercise, the MSOAs within the model study area and the model zones were overlayed in MapInfo to consider which zones commuters would travel to within the study area. The residentially-led land use zones 0 – 199 were excluded from this analysis. For MSOA's which had more than one sone within them, a proportion of the Census 2011 trips was assigned to each zone based on their size and the employment uses. The resultant trip distribution is presented in **Table 6.11** with the base data provided in **Appendix C.**

Table 6.11: Commuting Trip Distribution (Zones 200 - 499)

Zone	Arrive		Depart	
	%	12 hour Trips	%	12 hour Trips
200	0.393%	2	0.393%	2
201	0.309%	2	0.309%	2
202	0.224%	1	0.224%	1
203	0.672%	4	0.672%	4
204	2.978%	16	2.978%	18
205	0.496%	3	0.496%	3
206	0.744%	4	0.744%	5
207	0.629%	3	0.629%	4
300	1.059%	6	1.059%	6
301	0.678%	4	0.678%	4
302	0.339%	2	0.339%	2
303	1.059%	6	1.059%	6
304	0.079%	0	0.079%	0
305	0.309%	2	0.309%	2
306	0.079%	0	0.079%	0
307	0.139%	1	0.139%	1
308	0.209%	1	0.209%	1
309	0.139%	1	0.139%	1
400	0.393%	2	0.393%	2
401	1.235%	7	1.235%	8
402	0.209%	1	0.209%	1
403	0.209%	1	0.209%	1
404	0.209%	1	0.209%	1
405	0.278%	2	0.278%	2
407	0.744%	4	0.744%	5
408	0.678%	4	0.678%	4
409	0.224%	1	0.224%	1
410	1.634%	9	1.634%	10
411	2.911%	16	2.911%	18

Education Distribution

6.29 For education trips a first principles approach was undertaken to consider the distribution of these trips with a separate distribution profile developed for school trips within 1 mile and school trips outside of 1 mile. As specific schools were considered for the trip generation exercise, the model zones that these schools fall into were used for this exercise.

6.30 For trips within 1 mile of the site there are three schools therefore the trips are distributed evenly to the zones for these schools. For trips outside 1 mile there are seven schools therefore the trips are also distributed evenly to the zones for these schools. The trip distribution for education trips is provided in **Table 6.12.**

Table 6.12: Education Trip Distribution

Zone	Within 1 Mile (Daily Trips)			Outside 1 Mile (Daily Trips)		
	%	Arrive	Depart	%	Arrive	Depart
5	0.00%	0	0	14.29%	34	47
300	0.00%	0	0	14.29%	34	47
301	0.00%	0	0	14.29%	34	47
304	0.00%	0	0	14.29%	34	47
305	33.33%	11	16	0.00%	0	0
307	0.00%	0	0	14.29%	34	47
308	0.00%	0	0	14.29%	34	47
309	33.33%	11	16	0.00%	0	0
401	33.33%	11	16	0.00%	0	0
913	0.00%	0	0	14.29%	34	47

Recreation / Leisure Distribution

6.31 For the recreation/leisure trips a first principles approach was also adopted to consider the external zones that residents would travel to for recreation or leisure purposes. This exercise focused on locations where there was a defined shopping centre or retail high street, a gym or leisure centre and Preston city centre. The locations selected, their respective zones and the distribution assigned to these zones is presented in **Table 6.13.**

Table 6.13: Recreation / Leisure Trip Distribution

Zone	Area/Place	Distribution	Arrive	Depart
909	Preston Town Centre	12.5%	116	103
910	Preston Town Centre	12.5%	116	103
402	Lostock Hall / Tardy Gate	6.7%	62	55
403	Lostock Hall / Tardy Gate	6.7%	62	55
409	Lostock Hall / Tardy Gate	6.7%	62	55
913	Bamber Bridge	15.0%	139	123
1	Penwortham Leisure Centre	12.5%	116	103
411	Places Gym Preston	12.5%	116	103
410	Bamber Bridge Retail Park	15.0%	139	123

Local Plan Site Allocation (1,350 dwellings)

6.32 As outlined previously, the site allocation proposes up to 1,350 dwellings within the Local Plan. For this scenario, there are no alterations to trip generation or trip distribution profiles for the commuting trips or the recreation / leisure trips. There are some minor alterations made to the education trip generation and trip distribution to account for an increased number of internalised trips associated with there being a primary school on site.

Revised Education Trip Generation and Distribution

6.33 The trip generation profile for education trips was altered to take account of a new school within 1 mile of the site. As per the 1,100 unit scenario an even split of trips between the schools was considered assigning 36% of education trips to being within 1 mile of the site and 64% of trips to schools outside the 1 mile catchment.

6.34 Similarly with the trip distribution profile, an additional school was added into the within 1 mile distribution profile. With four schools within 1 mile, 25% of trips were assigned to each school as per the zone allocation presented in **Table 6.12.** To account for the internal trips generated by the school on-site there was no zone assigned to the 25% of trips which would travel to the school within the site. There were no alterations to the outside 1 mile trip distribution.

Summary

6.35 Based on the multi-modal trip demands presented in **Tables 6.5, Table 6.7, Table 6.8 and Table 6.9, Table 6.14** provides a summary of the multi-modal trip demand profile, unfettered by road congestion, or the mobility hub and community concierge package and progressive masterplan design, and not taking into account the pre COVID-19 trends and post COVID-19 changes in attitudes (i.e. significant increase in the numbers working from home thereby reducing peak period commuting).

Table 6.14: Total Multi-Modal Trip Demand (1,100 units)

Time	Drive		Passenger/Taxi		Walk		Cycle		Public Transport	
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	61	284	5	26	13	63	4	19	30	68
08:00 - 09:00	107	392	6	21	50	182	7	25	24	107
09:00 - 10:00	93	125	8	11	15	20	6	8	19	27
10:00 - 11:00	74	98	7	10	7	9	4	6	17	19
11:00 - 12:00	76	87	7	8	8	9	5	5	17	17
12:00 - 13:00	96	91	9	9	11	10	6	5	20	19
13:00 - 14:00	98	93	10	9	10	10	6	6	20	20
14:00 - 15:00	115	120	10	10	24	25	7	7	21	27
15:00 - 16:00	237	130	12	7	110	60	14	8	24	37
16:00 - 17:00	246	126	23	12	42	22	16	8	39	36
17:00 - 18:00	292	126	29	13	36	16	19	8	47	41
18:00 - 19:00	245	135	25	14	24	13	15	8	43	35

6.36 **Table 6.14** highlights the total trip demand profile for the development which highlights that during the typical AM peak hour the development would generate 499 two-way vehicle movements and 418 two-way vehicle movements during the typical PM peak period.

6.37 Using the trip generation profile outlined within this section of the report and the revised education trip generation, **Table 6.15** provides a summary of the multi-modal trip demand profile for the site allocation of 1,350 units.

Table 6.15: Total Multi-Modal Trip Demand (1,350 units)

Time	Drive		Passenger/Taxi		Walk		Cycle		Public Transport	
	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
07:00 - 08:00	71	334	7	31	17	78	5	23	35	77
08:00 - 09:00	115	421	7	26	62	227	7	26	40	106
09:00 - 10:00	110	149	10	14	19	25	7	9	22	32
10:00 - 11:00	90	119	9	12	9	11	5	7	17	23
11:00 - 12:00	93	105	9	10	10	11	6	6	17	21
12:00 - 13:00	116	111	11	11	13	13	7	7	21	23
13:00 - 14:00	119	112	12	11	13	12	7	7	22	24
14:00 - 15:00	135	141	12	13	29	31	8	9	27	31
15:00 - 16:00	255	140	15	8	137	75	15	8	58	38
16:00 - 17:00	294	150	28	14	52	27	19	10	52	43
17:00 - 18:00	354	153	36	16	45	19	23	10	58	50
18:00 - 19:00	299	165	31	17	29	16	19	10	50	43

6.38 **Table 6.15** highlight the total trip demand profile for the site allocation which highlights that during the typical AM peak hour the development would generate 536 two-way vehicle movements and 507 two-way vehicle movements during the typical PM peak period.

7 Highway Network Assessment

Modelling Approach

7.1 It is considered that that the most appropriate method for assessing the traffic effects of the proposed development would be to develop a micro-simulation model of the surrounding highway network using Paramics Discovery Version 24. The benefit of microsimulation modelling for a network such as this is that it accounts for interactions between junctions that are located close to each other which helps produce suitably representative modelling outputs which allow for an informed judgement to be made. As with all mathematical models, this is not intended to be an accurate representation of future reality, but the best tool to enable judgements to be made.

7.2 A baseline model of the network has been constructed with a Model Specification Report and Local Model Validation Report (LMVR) prepared which are included as **Appendix D** and **Appendix E** respectively. The LMVR describes the approach followed in developing the base model, summarises the data utilised, and present the calibration and validation results from the resulting model. The original model and LMVR were submitted to Systra Ltd for audit in July 2021.

7.3 The model enables the assessment of development to consider routing and assignment as well as the effects of traffic growth within a single model network. However, it is not capable of making judgements about temporal or modal reassignment of trips. It provides a wide coverage of the local area which allows for any routing effects to be quantified in a transparent fashion. The purpose of the model is to assist with making judgements about the likely consequences of changes, including new development and different highway infrastructure.

Study Area

7.4 The study area for the micro-simulation model encompasses the Lower Penwortham and Lostock Hall area, to the south of Preston. The network extent captures the A59, A582, A6, B5254 Leyland Road and the M6 Junction 29. In addition to this any local arterial routes identified within the study area have also been included (i.e. Chain House Lane, Coote Lane, Cop Lane and Pope Lane). **Figure 7.1** provides a summary of the extent of the model.

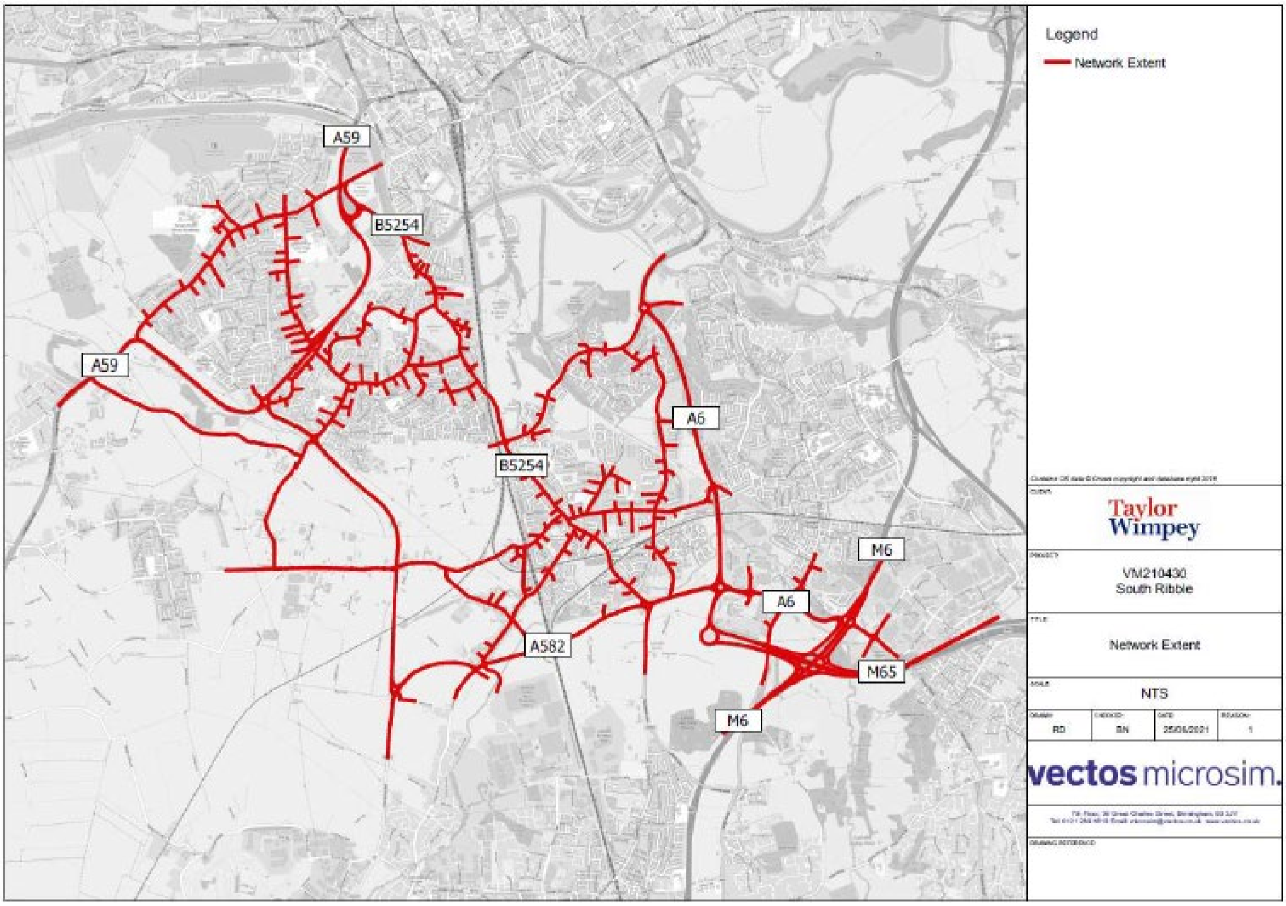


Figure 7.1: Model Extent

7.5 The corridors that the micro-simulation model focuses on are shown below in **Figure 7.2.** In determining the routes for analysis, it was considered that the key north/south and east/west movements through the study area would require capturing. Accordingly, journey times have been interrogated on the A582 Penwortham Way, A59, A6, B5254 Leyland Road and Coote Lane/Brownedge Road.

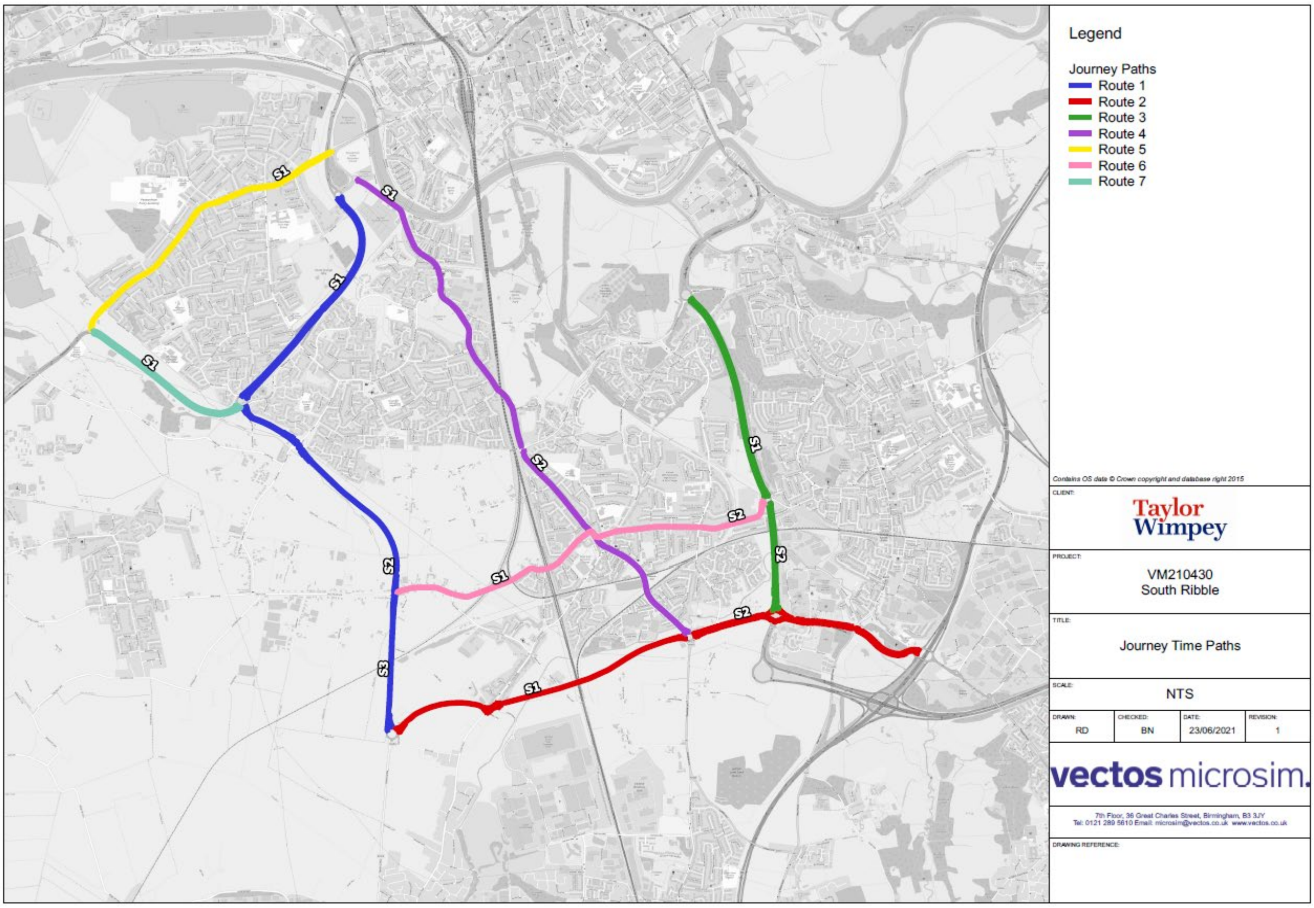


Figure 7.2: Journey Time Paths

7.6 Each journey time route has been reviewed using the Paramics model with a summary of the impact of the development proposals on these routes provided within this section of the report.

Committed Developments

7.7 During the preparation of the TA, consideration has been given to any committed developments in the areas which would need to be included when assessing the impact of the development on the local highway network. The list of committed development sites and how they have been captured in the micro-simulation modelling is presented in a Model Forecasting Note presented in **Appendix F**.

Scenario Testing

7.8 The following 'main case' scenarios have been assessed in the TA for the proposed development:

- **Scenario 1** – 2021 Base
- **Scenario 2** – 2031 Base + Committed Development (no dualling)
- **Scenario 3** – 2031 Base + Committed Development + Development at 1,100 dwellings (no dualling)

7.9 The following ‘sensitivity’ scenarios have been assessed in the TA considering the site allocation:

- **Scenario 4** – 2031 Base + Committed Development + Development at 1,350 dwellings (no dualling);
- **Scenario 5** – 2031 Base + Committed Development + Development at 1,350 dwellings (with dualling); and
- **Scenario 6** – 2031 Base + Committed Development + Development at 2,000 dwellings scenario (with dualling).

7.10 Full network model outputs are provided in **Appendix G** (available upon request).

Penwortham Way Site Access Review

7.11 The Paramics model considers the queues which form at key junctions within the model network including the site access. Using this information, it is possible to consider how the site access operates in all development scenarios and the queues likely at key times. **Table 7.1** provides a summary of the modelling results for the site access junction.

Table 7.1: Penwortham Way Site Access Queue Model Results

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	PW North	Site Access	PW South	PW North	Site Access	PW South
Scenario 3	7	8	22	12	3	10
Scenario 4	8	8	25	11	3	10
Scenario 5	10	6	14	10	3	15
Scenario 6	10	9	21	10	3	15

7.12 **Table 7.1** indicates that the maximum likely queue at the site access occurs on the southern arm of the site access junction with the longest queue recorded during the Scenario 4 sensitivity test for 1,350 dwellings without dualling. A review of the 10-minute intervals within the Paramics model indicates that this queue occurs during one 10-minute spike in traffic demand with the remainder of the hour relatively flat with minimal queuing.

7.13 Overall, it is considered that the design and operation of the proposed main site access on Penwortham Way is sufficient for the development demands.

Main Case Network Results

Overall Network Delay

7.14 The overall network delay is shown in **Figure 7.3**.

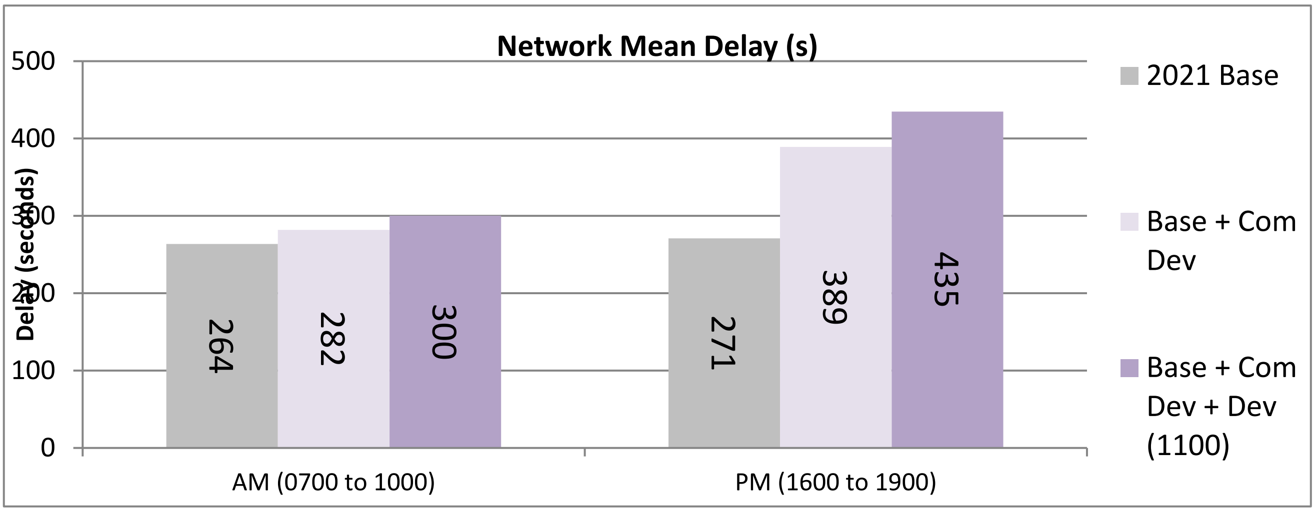


Figure 7.3: Main Case Network Mean Delay

7.15 The overall network results indicate that from Scenario 2 to Scenario 3, there will be an increase in delay in the AM peak period of 18 seconds, and an increase of 46 seconds in the PM peak period. These are marginal theoretical changes, and unlikely to be noticeable by many users. Given this, it is unlikely that there will be much practical shift in demand into other periods or other methods as a consequence, as would be expected under the Vision & Validate approach on more congested networks or in the face of greater impacts.

7.16 Further to this, from Scenario 1 there is an increase of only 36 seconds in the AM peak period and an increase of 164 seconds in the PM peak period. Our judgement is similar in the light of these results. We note though that the profile is likely to be peaky across the day, and that the neighbouring periods may have substantially lower journey times, which might attract some traffic into these periods.

Journey Time Analysis

7.17 The journey time results for Route 1 from the Paramics model are shown in **Table 7.2.**

Table 7.2: Paramics Route 1 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 1 SB	387	456	69	479	665	186
Route 1 NB	427	565	138	395	422	27

7.18 Route 1 experiences minor increases in journey times during the peak periods with the complete corridor experiencing a 207 second increase in delay during the AM peak period and 213 second increase during the PM peak period.

7.19 The journey time results for Route 2 from the Paramics model are shown in **Table 7.3.**

Table 7.3: Paramics Route 2 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 2 EB	526	568	42	592	575	-17
Route 2WB	595	598	3	1158	1310	152

7.20 Route 2 experiences minor increases in journey times during the AM peak period with a minor reduction in delay for eastbound trips during the PM peak hour. The complete corridor experiences a 45 second increase in delay during the AM peak period and a 135 second increase during the PM peak period.

7.21 The journey time results for Route 3 from the Paramics model are shown in **Table 7.4.**

Table 7.4: Paramics Route 3 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 3 SB	137	140	3	144	144	0
Route 3 NB	120	121	1	128	128	0

7.22 Some sections of Route 3 experience a negligible increase in journey times during the AM peak period with no change in journey time during the PM peak period.

7.23 The journey time results for Route 4 from the Paramics model are shown in **Table 7.5.**

Table 7.5: Paramics Route 4 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 4 SB	540	611	71	771	917	146
Route 4 NB	605	654	49	575	596	21

7.24 Route 4 experiences minor increases in journey times during the peak periods with the complete corridor experiencing a 120 second increase in delay during the AM peak period and 167 second increase during the PM peak period.

7.25 The journey time results for Route 5 from the Paramics model are shown in **Table 7.6.**

Table 7.6: Paramics Route 5 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 5 SB	338	346	8	314	322	8
Route 5 NB	276	271	-5	234	229	-5

7.26 Route 5 experiences a negligible increase in journey times during both the AM and PM peak periods for trips travelling southbound with a reduction in journey times recorded for trips travelling northbound.

7.27 The journey time results for Route 6 from the Paramics model are shown in **Table 7.7.**

Table 7.7: Paramics Route 6 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 6 EB	438	549	111	656	832	176
Route 6 WB	413	414	1	637	661	24

7.28 Route 6 experiences minor increases in journey times during the peak periods with the complete corridor experiencing a 112 second increase in delay during the AM peak period and a 200 second increase during the PM peak period.

7.29 The journey time results for Route 7 from the Paramics model are shown in **Table 7.8.**

Table 7.8: Paramics Route 7 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 3	Diff. (seconds)	Scenario 2	Scenario 3	Diff. (seconds)
Route 7 EB	98	91	-7	69	69	0
Route 7 WB	66	66	0	61	61	0

7.30 Route 7 is largely unchanged by the introduction of the development with only a negligible decrease in journey times for vehicles travelling eastbound during the AM peak period.

Summary

7.31 Based on the Network Statistics, the existing delay on the network is 264 seconds in the AM peak period and 271 seconds in the PM peak period. The proposed development, based on the first iteration of the unfettered demand flows and no substitution of background traffic, would result in an increase in delay of 36 seconds in the AM peak period and 164 seconds in the PM peak period. The network mean delay on the network is around 300 seconds in the AM peak period and 435 seconds in the PM peak period. This level of mathematical change is not significant and is comparable to the mathematical existing level of delay on the network.

7.32 The corridor assessments demonstrate that there are some routes within the study area which experience minor increases in delay during the peak periods as a result of the proposed development. However, the level of delay is not significant, and, on many routes, there are reductions or no changes in journey times. On the basis of Vision & Validate, traffic impact in commuter peak periods is unlikely to be a determinant of pass or fail, as when the network gets busier the volume of total traffic is largely a function of road space. Based on this analysis, the unfettered demand for travel by car on the road network will not make any substantial difference to the characteristics of that network, before taking into account the enhanced sustainability benefits for accessibility designed into the development, and any effects of increasing delay on the road network.

Sensitivity Case Network Results

Overall Network Delay

7.33 The overall network delay is shown in **Figure 7.4**.

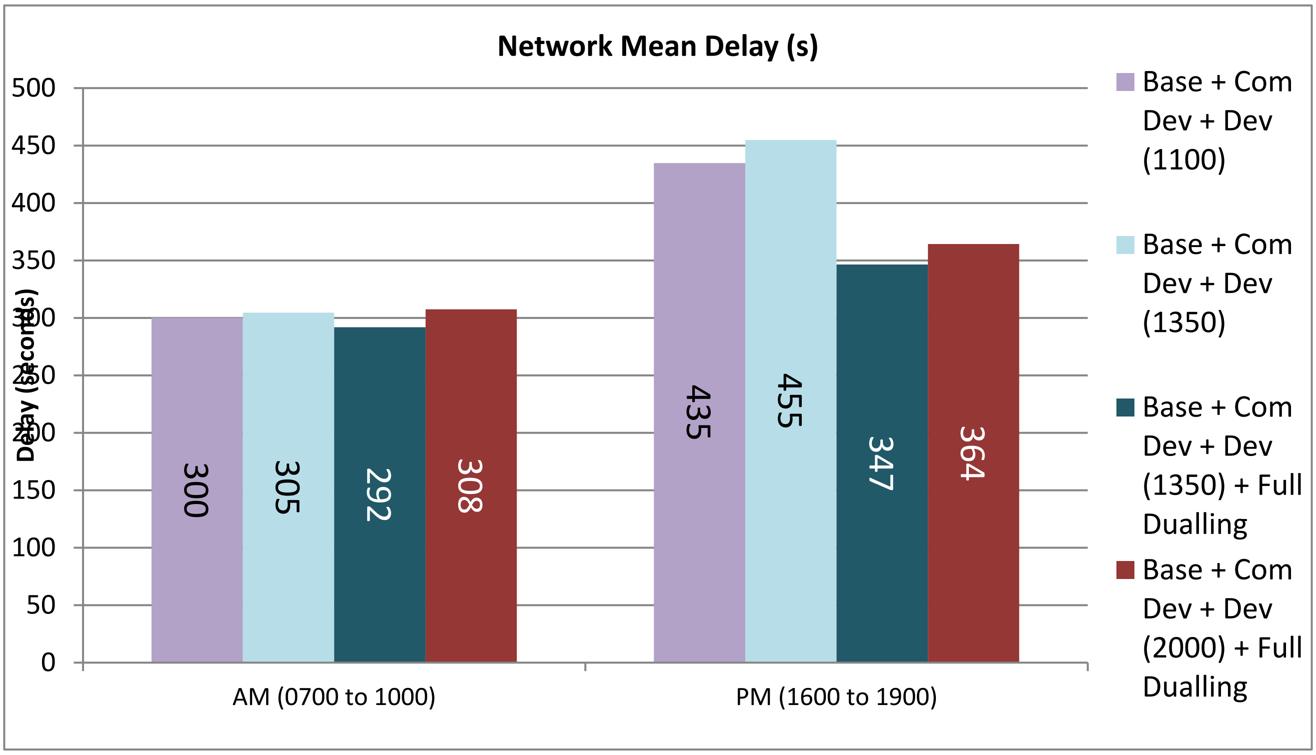


Figure 7.4: Sensitivity Test Network Mean Delay

7.34 The overall network results indicate that from Scenario 3 to Scenario 4 there will be an increase in delay in the AM peak period of 5 seconds, and an increase of 10 seconds in the PM peak period. This is an acceptable level of impact in the planning policy context as expressed within the NPPF.

7.35 When the dualling of Penwortham Way is taken into consideration there is a decrease in the mean network delay for the 1,350 dwelling scenario. From Scenario 4 to Scenario 5 this decrease in delay in the AM peak period is 13 seconds, and 108 seconds in the PM peak period. However, it should be noted that this assumes a fixed model demand.

7.36 Further to this, from Scenario 1 to Scenario 6 there is an increase of only 44 seconds in the AM peak period and an increase of 93 seconds in the PM peak period. This is also an acceptable level of change in the planning policy context.

Journey Time Analysis

7.37 This journey time analysis review will consider the impact on journey times between Scenario 2 (Base plus Committed Development) and Scenario 4 (Base plus Committed Development plus Development at 1,350 dwellings). The journey time results for Route 1 from the Paramics model are shown in **Table 7.9.**

Table 7.9: Paramics Route 1 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 1 SB	387	470	83	479	709	230
Route 1 NB	427	577	150	395	424	29

7.38 Route 1 experiences minor increases in journey times during the peak periods with the complete corridor experiencing a 233 second increase in delay during the AM peak period and 259 second increase during the PM peak period. Compared with the development of 1,100 dwellings this represents an increase in delay of 26 and 46 seconds respectively.

7.39 The journey time results for Route 2 from the Paramics model are shown in **Table 7.10.**

Table 7.10: Paramics Route 2 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 2 EB	526	599	73	592	573	-19
Route 2WB	595	600	5	1158	1310	152

7.40 Route 2 experiences minor increases in journey times during the AM peak period with a minor reduction in delay for eastbound trips during the PM peak hour. The complete corridor experiences a 78 second increase in delay during the AM peak period and a 133 second increase during the PM peak period. Compared with the development of 1,100 dwellings this represents an increase in delay of 33 seconds in the AM peak and a reduction of 2 seconds in the PM peak period.

7.41 The journey time results for Route 3 from the Paramics model are shown in **Table 7.11**.

Table 7.11: Paramics Route 3 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 3 SB	137	140	3	144	145	1
Route 3 NB	120	122	2	128	129	1

7.42 All sections of Route 3 experience a negligible increase in journey times during both the AM and PM peak period which is comparable to the results presented for the 1,100 dwelling scenario.

7.43 The journey time results for Route 4 from the Paramics model are shown in **Table 7.12.**

Table 7.12: Paramics Route 4 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 4 SB	540	637	97	771	921	150
Route 4 NB	605	675	70	575	603	28

7.44 Route 4 experiences minor increases in journey times during the peak periods with the complete corridor experiencing a 167 second increase in delay during the AM peak period and 178 second increase during the PM peak period. Compared with the development of 1,100 dwellings this represents an increase in delay of 47 seconds in the AM peak and 11 seconds in the PM peak period.

7.45 The journey time results for Route 5 from the Paramics model are shown in **Table 7.13.**

Table 7.13: Paramics Route 5 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 5 SB	338	347	9	314	327	13
Route 5 NB	276	272	-4	234	243	9

7.46 Route 5 experiences a negligible increase in journey times during both the AM and PM peak periods for trips travelling southbound with a reduction in journey times recorded for trips travelling northbound which is comparable to the results presented for the 1,100 dwelling scenario.

7.47 The journey time results for Route 6 from the Paramics model are shown in **Table 7.14.**

Table 7.14: Paramics Route 6 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 6 EB	438	598	160	656	783	127
Route 6 WB	413	420	7	637	717	80

7.48 Route 6 experiences minor increases in journey times during the peak periods with the complete corridor experiencing a 167 second increase in delay during the AM peak period and a 207 second increase during the PM peak period. Compared with the development of 1,100 dwellings this represents an increase in delay of 55 seconds in the AM peak and 7 seconds in the PM peak period.

7.49 The journey time results for Route 7 from the Paramics model are shown in **Table 7.15.**

Table 7.15: Paramics Route 7 Delay Results (seconds)

	AM Peak 0800 – 0900			PM Peak 1700 – 1800		
	Scenario 2	Scenario 4	Diff. (seconds)	Scenario 2	Scenario 4	Diff. (seconds)
Route 7 EB	98	94	-4	69	69	0
Route 7 WB	66	66	0	61	61	0

7.50 Route 7 is largely unchanged by the introduction of the development with only a negligible decrease in journey times for vehicles travelling eastbound during the AM peak period which is comparable to the results presented for the 1,100 dwelling scenario.

Summary

7.51 The results of the sensitivity tests outlined above indicate that a development scale of 1,350 dwellings would results in a network delay of 305 seconds in the AM peak period and 455 seconds in the PM peak period, an increase of 5 and 20 seconds respectively from the 1,100 dwelling scenario.

7.52 Again, the corridor assessments demonstrate that there are some routes within the study area which experience minor increases in delay during the peak periods as a result of the site allocation sensitivity scenarios, but the level of delay is not significant. Based on this analysis, the unfettered demand for travel by car on the road network will not make any substantial difference to the characteristics of that network, before taking into account the enhanced sustainability benefits for accessibility designed into the development, and any effects of increasing delay on the road network.

Highways England Network Results

7.53 The Paramics model includes the M6 Junction 29 and M65 Junction 1 motorway junctions which are managed by Highways England. In reviewing the impact of the development proposals on the local highway network, consideration has also been given to the impact of the development on the strategic road network. Due to the complex nature of these links, increases in traffic flow near these junctions has been considered with this information presented in **Table 7.16.**

Table 7.16: Highway England Network Link Flow Results

	AM Peak 0800 – 0900				PM Peak 1700 – 1800			
	Sc. 1	Sc. 2	Sc. 3	Sc. 4	Sc. 1	Sc. 2	Sc. 3	Sc. 4
Link 1 (south of M6 J29)	7,496	7,630	7,633	7,631	7,753	7,877	7,438	7,425
Link 3 (north of M6 J29)	5,538	5,685	5,701	5,704	6,060	6,216	6,004	5,974
Link 6 (east of M6 J29)	4,245	4,427	4,448	4,452	4,033	4,311	4,229	4,228
Link 8 (M65 west of M6 J29)	3,249	3,801	3,835	3,836	3,504	4,076	3,965	3,988

7.54 As highlighted in **Table 7.16** there is an increase in trips on all links around Junction 29 of the M6 between Scenario 1 (Base 2021) and Scenario 2 (Base plus Committed Development) during both the AM and PM peak periods. When taking into consideration the development of 1,100 dwellings (Scenario 3) and 1,350 dwellings (Scenario 4) there is a negligible increase in trips between these two scenarios and Scenario 2 during the AM peak period. In the PM peak period, there is a reduction in trips on Link 1, 3 and 8 and an increase in trips on Link 6 when considering the impact of the development proposals.

7.55 Notwithstanding the minor increase in trips, 5% in the AM and 1% in the PM peak periods, the unfettered demand for travel by car on the road network will not make any substantial difference to the characteristics of that network

8 Summary and Conclusions

8.1 Vectos has been instructed by Taylor Wimpey and Homes England to provide transport and mobility advice in relation to a proposed residential-led mixed-use development on land to the east of Penwortham Way.

8.2 The proposed development is actually part of a wider site allocation within the South Ribble Local Plan, known locally as Pickering's Farm. The Local Plan envisages up to 1,350 residential dwellings being provided on the site allocation within the Plan period, with associated necessary infrastructure.

8.3 Planning applications for a substantial, part of the overall site allocation and its associated infrastructure are proposed. Specifically, these applications (referred to as the proposed development) seek to provide up to 1,100 dwellings with the intention of delivering much needed housing, whilst also facilitating further development of the site allocation as identified in the Local Plan period, and beyond.

8.4 Access is proposed via a new access on Penwortham Way which will serve the vast majority of the proposed development, being sufficient for the development demands, whilst not prejudicing the delivery of additional dwellings within the site allocation. An additional vehicular access is proposed from Bee Lane for a small scale of residential development of up to 40 dwellings.

8.5 The location and accessibility of the site are excellent, as they allow for opportunities to live locally, undertake healthy living, use sustainable and socially inclusive modes of travel and enhance the vitality of local facilities for existing residents. The mobility characteristics in these respects are of significant benefit.

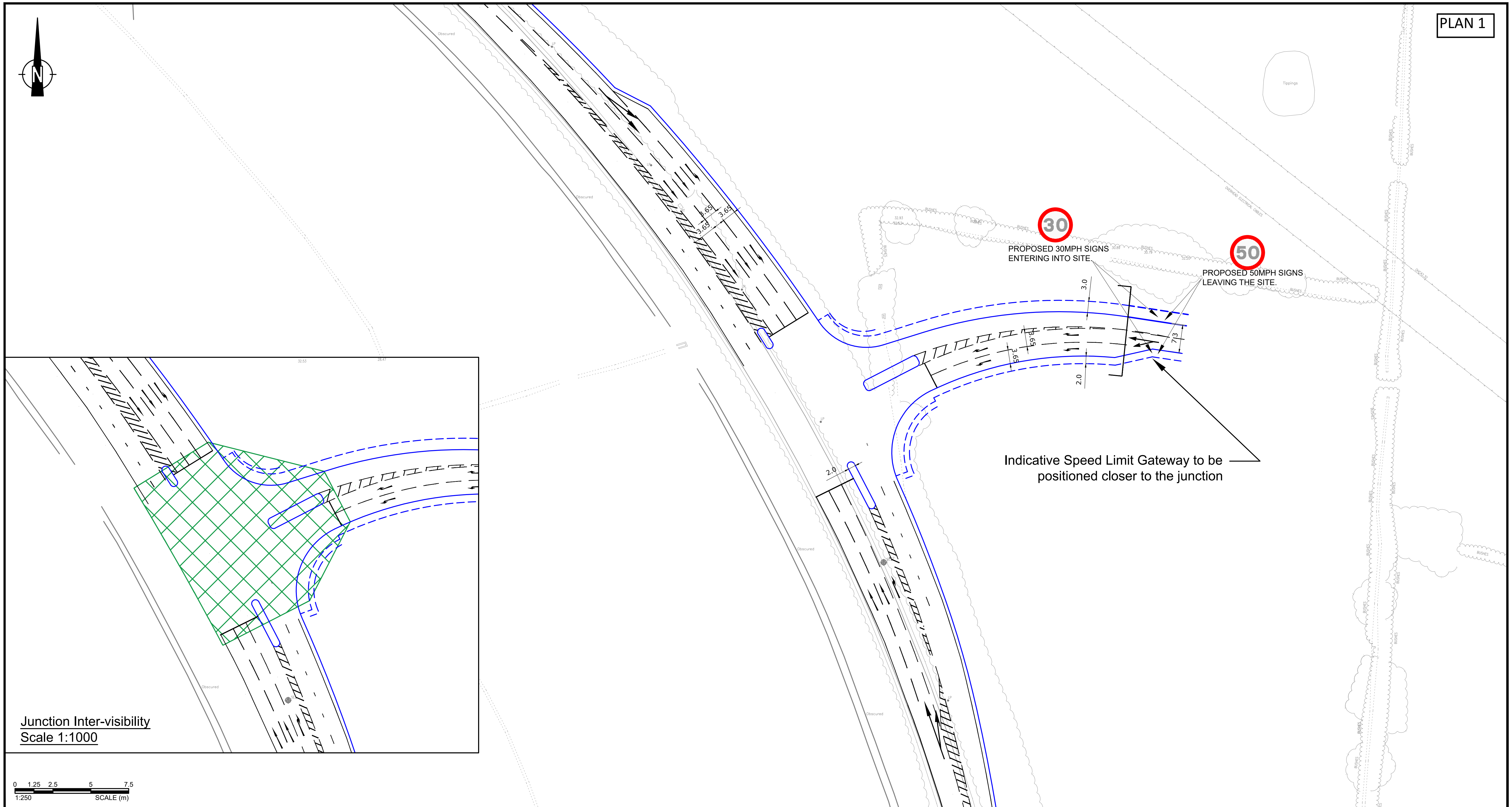
8.6 The facilities included as part of the proposed development, Travel Plan, public transport improvements and pedestrian and cycle initiatives will provide a cohesive and sustainable living environment where mobility occurs in the way envisaged by planning policy. The consequence is also minimal reliance on, and effects of, private car travel.

8.7 The modelling results lead easily to a judgement that the proposed development would not have a severe impact on the highway network. Informed by these results, cognisant of the assumptions, and in the context of planning policy, it is reasonable to conclude that the proposed development will not make any substantial difference to the characteristics of that network, before taking into account the enhanced sustainability benefits for accessibility designed into the development, and any effects of increasing delay on the road network.

8.8 The overall mobility package is strongly positive, with major contributions to sustainable and healthy living, and limited effects to the highway network. Thus, based on all the above evidence and analysis, there is good reason to encourage this scheme and no reasonable grounds on which to resist this development.

Plans

Plan 1 – Proposed Penwortham Way Site Access (Single)



REV.	DETAILS	DRAWN	CHECKED	DATE
.	.	.	.	.

Notes:

1. This is not a construction drawing and is intended for illustrative purposes only.
2. White lining is indicative only.

The Lanes, Penwortham

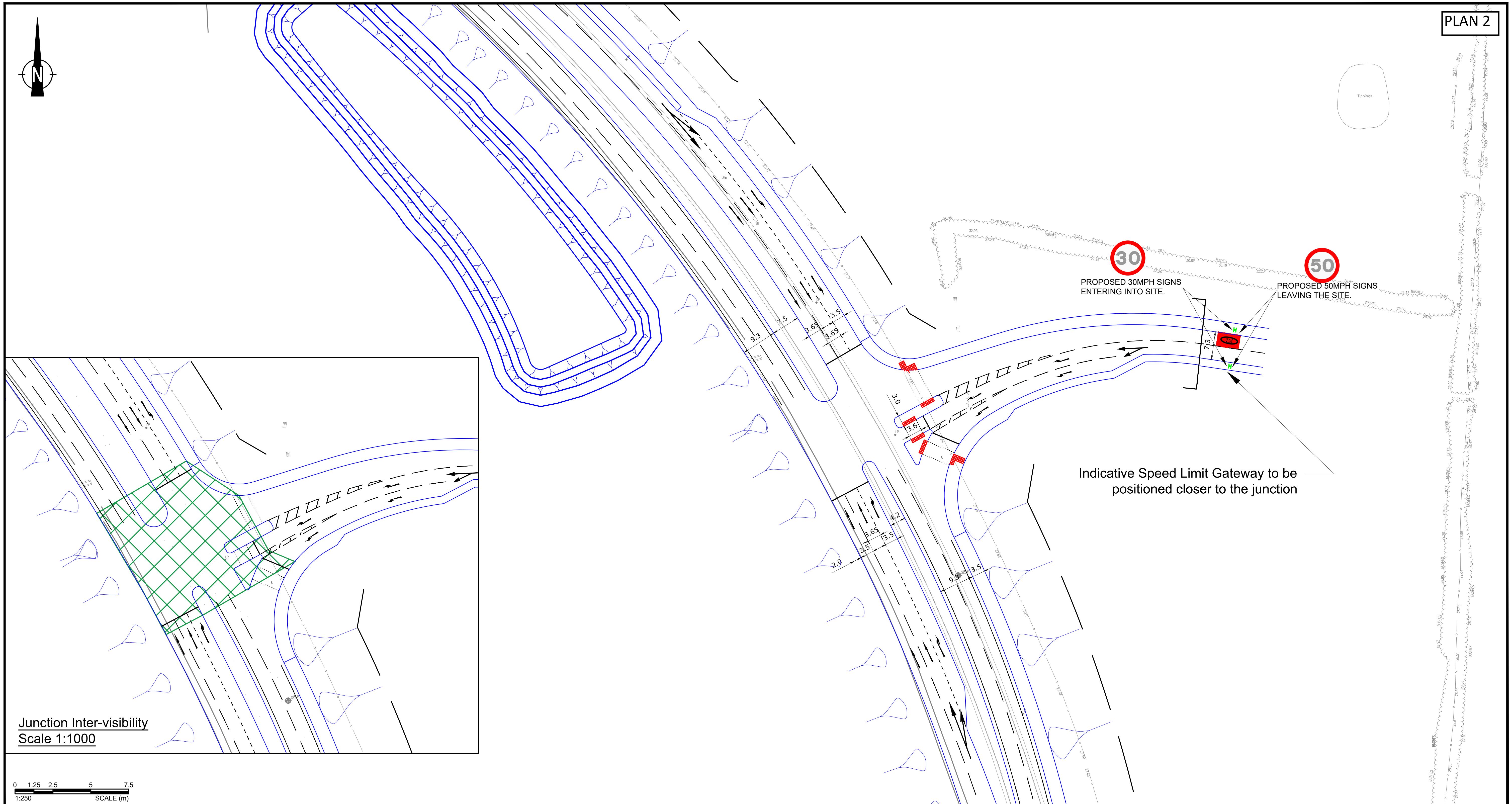
Taylor Wimpey / Homes England

Proposed Site Access Arrangement (Single Carriageway Approach)

vectos.
4th Floor Oxford Place, 61 Oxford Street, Manchester, M1 6EQ
0161 228 1008 e: manchester@vectos.co.uk

DRAWN:	CHECKED:	DATE:	SCALES:	DRAWING NUMBER:	REVISION:
DJR	PW	22.07.21	1:1000 at A3	VN211918-D103	.

Plan 2 – Indicative Penwortham Way Site Access (Dual)



REV.	DETAILS	DRAWN	CHECKED	DATE
.	.	.	.	.

Notes:

1. This is not a construction drawing and is intended for illustrative purposes only.
2. White lining is indicative only.
3. This drawing is based on Lancashire County Council's proposals for dualling as per planning reference LCC/2020/0014

The Lanes, Penwortham

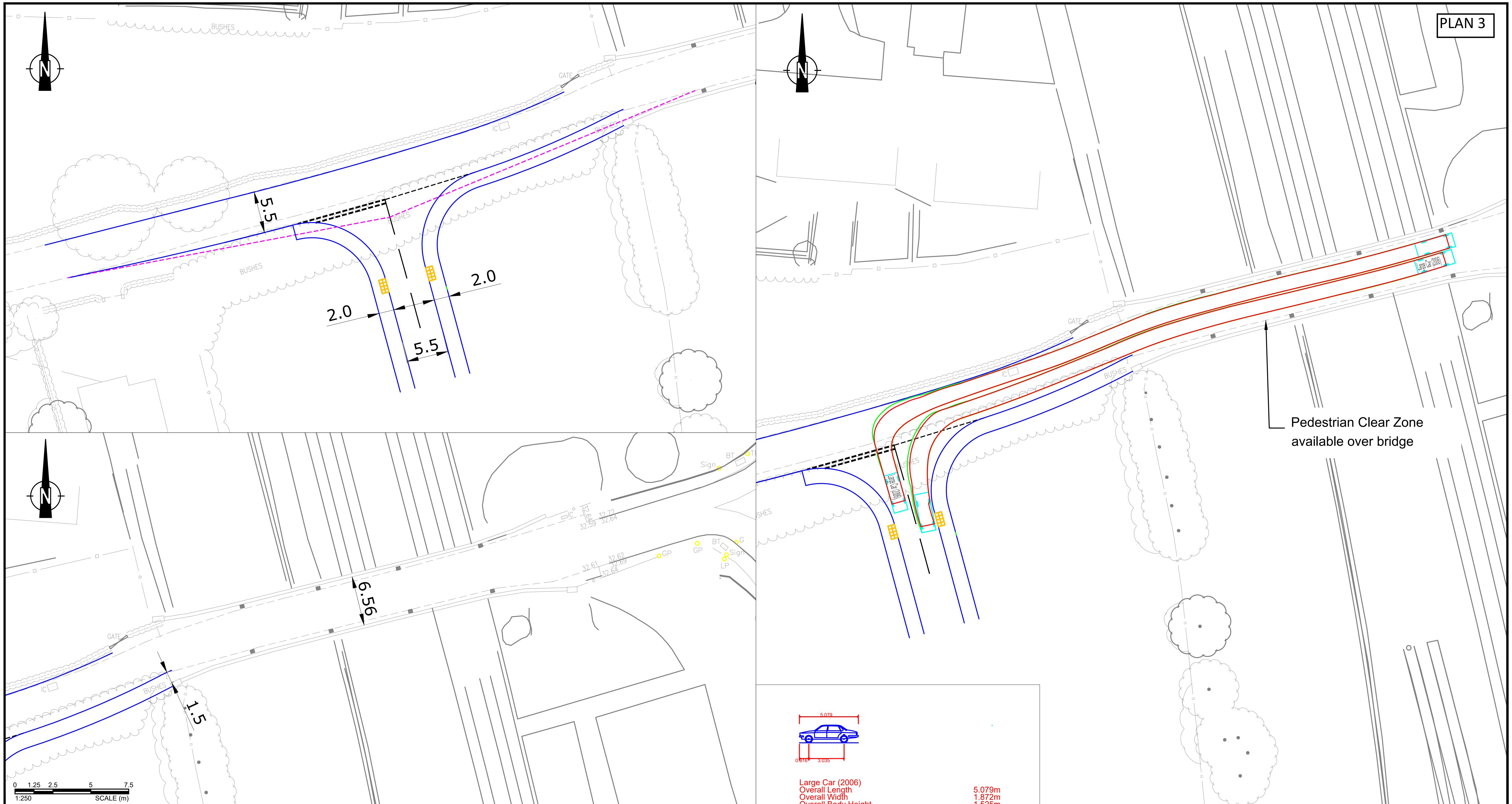
Taylor Wimpey / Homes England

Indicative Site Access Arrangement (Dualled Approach)

vectos.
4th Floor Oxford Place, 61 Oxford Street, Manchester, M1 6EQ
0161 228 1008 e: manchester@vectos.co.uk

DRAWN:	CHECKED:	DATE:	SCALES:	DRAWING NUMBER:	REVISION:
DJR	PW	22.07.21	1:1000 at A3	VN211918-D103	.

Plan 3 – Proposed Bee Lane Site Access



REV.	DETAILS	DRAWN	CHECKED	DATE
.	.	.	.	.

Notes:

1. This is not a construction drawing and is intended for illustrative purposes only.
2. White lining is indicative only.

Key

- - - - - - Visibility Splay at junction 2m x 43m for 30mph road speed in accordance with Manual for Streets.

The Lanes, Penwortham

Taylor Wimpey / Homes England

Proposed Site Access Arrangement (Bee Lane)

vectos.
4th Floor Oxford Place, 61 Oxford Street, Manchester, M1 6EQ
0161 228 1008 e: manchester@vectos.co.uk

DRAWN:	CHECKED:	DATE:	SCALES:	DRAWING NUMBER:	REVISION:
DJR	PW	04/08/21	1:500 at A3	VN211918-D105	.

Appendices

Appendix A - TRICS Person Trips

Calculation Reference: AUDIT-715001-210513-0525

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
MULTI-MODAL TOTAL VEHICLES

Selected regions and areas:

02	SOUTH EAST		
	ES	EAST SUSSEX	2 days
	HF	HERTFORDSHIRE	1 days
	KC	KENT	2 days
	SC	SURREY	1 days
	WS	WEST SUSSEX	4 days
04	EAST ANGLIA		
	NF	NORFOLK	2 days
05	EAST MIDLANDS		
	DS	DERBYSHIRE	1 days
06	WEST MIDLANDS		
	ST	STAFFORDSHIRE	1 days
07	YORKSHIRE & NORTH LINCOLNSHIRE		
	NE	NORTH EAST LINCOLNSHIRE	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
Actual Range: 110 to 984 (units:)
Range Selected by User: 100 to 1817 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/13 to 08/10/20

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	5 days
Tuesday	3 days
Wednesday	2 days
Thursday	3 days
Friday	2 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	15 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town	15

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	14
No Sub Category	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3	15 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:
All Surveys Included
Population within 1 mile:

1,000 or Less	1 days
1,001 to 5,000	1 days
5,001 to 10,000	4 days
10,001 to 15,000	7 days
15,001 to 20,000	1 days
20,001 to 25,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	2 days
50,001 to 75,000	2 days
75,001 to 100,000	4 days
125,001 to 250,000	7 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	5 days
1.1 to 1.5	8 days
1.6 to 2.0	2 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

Yes	8 days
No	7 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	15 days

This data displays the number of selected surveys with PTAL Ratings.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
MULTI-MODAL TOTAL VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	15	324	0.068	15	324	0.297	15	324	0.365
08:00 - 09:00	15	324	0.133	**15**	**324**	**0.368**	**15**	**324**	**0.501**
09:00 - 10:00	15	324	0.135	15	324	0.164	15	324	0.299
10:00 - 11:00	15	324	0.108	15	324	0.133	15	324	0.241
11:00 - 12:00	15	324	0.113	15	324	0.119	15	324	0.232
12:00 - 13:00	15	324	0.136	15	324	0.134	15	324	0.270
13:00 - 14:00	15	324	0.138	15	324	0.130	15	324	0.268
14:00 - 15:00	15	324	0.156	15	324	0.167	15	324	0.323
15:00 - 16:00	15	324	0.232	15	324	0.165	15	324	0.397
16:00 - 17:00	15	324	0.256	15	324	0.153	15	324	0.409
17:00 - 18:00	**15**	**324**	**0.334**	15	324	0.151	15	324	0.485
18:00 - 19:00	15	324	0.303	15	324	0.156	15	324	0.459
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.112			2.137			4.249

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	110 - 984 (units:)
Survey date date range:	01/01/13 - 08/10/20
Number of weekdays (Monday-Friday):	15
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	1
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
MULTI-MODAL TOTAL PEOPLE
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	15	324	0.106	15	324	0.496	15	324	0.602
08:00 - 09:00	15	324	0.210	**15**	**324**	**0.767**	**15**	**324**	**0.977**
09:00 - 10:00	15	324	0.208	15	324	0.281	15	324	0.489
10:00 - 11:00	15	324	0.177	15	324	0.235	15	324	0.412
11:00 - 12:00	15	324	0.183	15	324	0.208	15	324	0.391
12:00 - 13:00	15	324	0.226	15	324	0.215	15	324	0.441
13:00 - 14:00	15	324	0.225	15	324	0.213	15	324	0.438
14:00 - 15:00	15	324	0.259	15	324	0.270	15	324	0.529
15:00 - 16:00	15	324	0.512	15	324	0.281	15	324	0.793
16:00 - 17:00	15	324	0.515	15	324	0.264	15	324	0.779
17:00 - 18:00	**15**	**324**	**0.582**	15	324	0.252	15	324	0.834
18:00 - 19:00	15	324	0.531	15	324	0.292	15	324	0.823
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			3.734			3.774			7.508

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Appendix B - NTS Data

Department for Transport statistics
National Travel Survey

Table NTS0502
Trip start time by trip purpose (Monday to Friday only): England, 2015/2019[1]

Start time	Commuting	Business	Education	Escort education	Shopping	Other work, other escort and personal business	Visiting friends / entertainment / sport	Holiday / Day trip / Other	All purposes	Unweighted sample size (trips '000s)
	Percentage									
0000 - 0059	*49*	*3*	*1*	*-*	*3*	*11*	*27*	*5*	*100*	1
0100 - 0159	*51*	*4*	*-*	*-*	*1*	*8*	*32*	*4*	*100*	-
0200 - 0259	*63*	*3*	*0*	*-*	*2*	*7*	*13*	*10*	*100*	-
0300 - 0359	*62*	*7*	*2*	*-*	*2*	*9*	*8*	*10*	*100*	1
0400 - 0459	*71*	*8*	*-*	*-*	*1*	*8*	*3*	*9*	*100*	2
0500 - 0559	*75*	*6*	*-*	*-*	*1*	*6*	*3*	*7*	*100*	7
0600 - 0659	*66*	*7*	*1*	*-*	*2*	*9*	*4*	*10*	*100*	20
0700 - 0759	*48*	*6*	*14*	*5*	*3*	*14*	*4*	*6*	*100*	56
0800 - 0859	*20*	*3*	*29*	*23*	*4*	*14*	*3*	*4*	*100*	118
0900 - 0959	*11*	*5*	*3*	*7*	*22*	*26*	*15*	*12*	*100*	58
1000 - 1059	*5*	*4*	*2*	*-*	*34*	*24*	*17*	*14*	*100*	60
1100 - 1159	*5*	*4*	*2*	*2*	*35*	*23*	*18*	*11*	*100*	61
1200 - 1259	*7*	*4*	*2*	*2*	*30*	*25*	*20*	*9*	*100*	58
1300 - 1359	*10*	*5*	*2*	*1*	*28*	*24*	*19*	*10*	*100*	54
1400 - 1459	*10*	*4*	*4*	*11*	*25*	*20*	*17*	*10*	*100*	61
1500 - 1559	*7*	*2*	*26*	*21*	*12*	*14*	*12*	*6*	*100*	112
1600 - 1659	*22*	*4*	*7*	*4*	*15*	*20*	*18*	*10*	*100*	75
1700 - 1759	*32*	*3*	*3*	*2*	*12*	*20*	*20*	*8*	*100*	76
1800 - 1859	*21*	*3*	*1*	*1*	*15*	*18*	*31*	*11*	*100*	55
1900 - 1959	*11*	*2*	*1*	*-*	*16*	*18*	*41*	*11*	*100*	37
2000 - 2059	*13*	*3*	*1*	*-*	*14*	*15*	*43*	*11*	*100*	23
2100 - 2159	*14*	*3*	*1*	*-*	*9*	*15*	*49*	*9*	*100*	16
2200 - 2259	*22*	*3*	*-*	*-*	*5*	*11*	*50*	*9*	*100*	11
2300 - 2359	*24*	*2*	*1*	*-*	*3*	*11*	*52*	*6*	*100*	6
All day	*18*	*4*	*9*	*8*	*17*	*19*	*18*	*9*	*100*	985

1 Five survey years combined.

The figures in this table are National Statistics

The results presented in this table are weighted. The base (unweighted sample size) is shown in the table for information. Weights are applied to adjust for non-response to ensure the characteristics of the achieved sample match the population of Great Britain (1995-2012) or England (2013 onwards) and for the drop off in trip recording in diary data. The survey results are subject to sampling error.
Data for 2002-2015 have been revised, see publication for details.

Source: National Travel Survey
Last updated: 5 August 2020
Next update: Summer 2021

national.travelsurvey@dft.gov.uk
Notes & definitions

Department for Transport statistics
National Travel Survey

Table NTS0614
Trips to school[1] by main mode, trip length and age: England, 2002 onwards

Select year:	2019

	Percentage									
	Aged 5-10 years					Aged 11-16 years				
Main mode	Under 1 mile	1 to under 2 miles	2 to under 5 miles	5 miles and over	All lengths	Under 1 mile	1 to under 2 miles	2 to under 5 miles	5 miles and over	All lengths
Walk	*80*	*19*	*1*	*0*	*46*	*95*	*53*	*6*	*0*	*39*
Bicycle	*1*	*4*	*1*	*0*	*1*	*2*	*6*	*3*	*0*	*3*
Car / van	*18*	*71*	*87*	*73*	*47*	*3*	*28*	*37*	*36*	*26*
Bus[2]	*1*	*5*	*9*	*18*	*5*	*1*	*11*	*50*	*54*	*29*
Other transport[3]	-	*1*	*1*	*9*	*1*	*0*	*1*	*5*	*11*	*4*
All modes	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Unweighted sample size: trips	3,801	1,770	1,237	582	7,390	1,649	1,455	1,809	1,409	6,322

Select main mode:	All modes

	Percentage (all modes = 100%)									
	Aged 5-10 years					Aged 11-16 years				
Year	Under 1 mile	1 to under 2 miles	2 to under 5 miles	5 miles and over	All lengths	Under 1 mile	1 to under 2 miles	2 to under 5 miles	5 miles and over	All lengths
2002	100	100	100	100	100	100	100	100	100	100
2003	100	100	100	100	100	100	100	100	100	100
2004	100	100	100	100	100	100	100	100	100	100
2005	100	100	100	100	100	100	100	100	100	100
2006	100	100	100	100	100	100	100	100	100	100
2007	100	100	100	100	100	100	100	100	100	100
2008	100	100	100	100	100	100	100	100	100	100
2009	100	100	100	100	100	100	100	100	100	100
2010	100	100	100	100	100	100	100	100	100	100
2011	100	100	100	100	100	100	100	100	100	100
2012	100	100	100	100	100	100	100	100	100	100
2013	100	100	100	100	100	100	100	100	100	100
2014	100	100	100	100	100	100	100	100	100	100
2015	100	100	100	100	100	100	100	100	100	100
2016	100	100	100	100	100	100	100	100	100	100
2017	100	100	100	100	100	100	100	100	100	100
2018	100	100	100	100	100	100	100	100	100	100
2019	100	100	100	100	100	100	100	100	100	100

1 Education trips of under 50 miles only.
2 Private and local bus.
3 Rail and other modes of transport.
4 Walk includes all travel on foot. It is also used when respondents ride in non-motorised wheelchairs, prams or pushchairs, as well as when they ride on toy bicycles, roller-skates, skateboards, non-motorised scooters, or when they jog. For example, children who accompany their parents on a visit to the shops on toy bicycles/tricycles (where the parents are walking) are coded as having walked there.
In this table figures show the proportion of trips of that length by that age group which were made using that main mode
The figures in this table are National Statistics.
The results presented in this table are weighted. The base (unweighted sample size) is shown in the table for information.
The survey results are subject to sampling error.

Source: National Travel Survey
Last updated: 5 August 2020
Next update: Summer 2021

national.travelsurvey@dft.gov.uk
Notes & definitions

Appendix C - Commuting Trip Distribution

Zone	AM				Inter-peak				PM			
	Outbound		Inbound		Outbound		Inbound		Outbound		Inbound	
200	7	0.393%	7	0.393%	7	0.393%	7	0.393%	7	0.393%	7	0.393%
201	5	0.309%	5	0.309%	5	0.309%	5	0.309%	5	0.309%	5	0.309%
202	4	0.224%	4	0.224%	4	0.224%	4	0.224%	4	0.224%	4	0.224%
203	11	0.672%	11	0.672%	11	0.672%	11	0.672%	11	0.672%	11	0.672%
204	49	2.978%	49	2.978%	49	2.978%	49	2.978%	49	2.978%	49	2.978%
205	8	0.496%	8	0.496%	8	0.496%	8	0.496%	8	0.496%	8	0.496%
206	12	0.744%	12	0.744%	12	0.744%	12	0.744%	12	0.744%	12	0.744%
207	10	0.629%	10	0.629%	10	0.629%	10	0.629%	10	0.629%	10	0.629%
300	18	1.059%	18	1.059%	18	1.059%	18	1.059%	18	1.059%	18	1.059%
301	11	0.678%	11	0.678%	11	0.678%	11	0.678%	11	0.678%	11	0.678%
302	6	0.339%	6	0.339%	6	0.339%	6	0.339%	6	0.339%	6	0.339%
303	18	1.059%	18	1.059%	18	1.059%	18	1.059%	18	1.059%	18	1.059%
304	1	0.079%	1	0.079%	1	0.079%	1	0.079%	1	0.079%	1	0.079%
305	5	0.309%	5	0.309%	5	0.309%	5	0.309%	5	0.309%	5	0.309%
306	1	0.079%	1	0.079%	1	0.079%	1	0.079%	1	0.079%	1	0.079%
307	2	0.139%	2	0.139%	2	0.139%	2	0.139%	2	0.139%	2	0.139%
308	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%
309	2	0.139%	2	0.139%	2	0.139%	2	0.139%	2	0.139%	2	0.139%
400	7	0.393%	7	0.393%	7	0.393%	7	0.393%	7	0.393%	7	0.393%
401	20	1.235%	20	1.235%	20	1.235%	20	1.235%	20	1.235%	20	1.235%
402	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%
403	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%
404	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%	3	0.209%
405	5	0.278%	5	0.278%	5	0.278%	5	0.278%	5	0.278%	5	0.278%
407	12	0.744%	12	0.744%	12	0.744%	12	0.744%	12	0.744%	12	0.744%
408	11	0.678%	11	0.678%	11	0.678%	11	0.678%	11	0.678%	11	0.678%
409	4	0.224%	4	0.224%	4	0.224%	4	0.224%	4	0.224%	4	0.224%
410	27	1.634%	27	1.634%	27	1.634%	27	1.634%	27	1.634%	27	1.634%
411	48	2.911%	48	2.911%	48	2.911%	48	2.911%	48	2.911%	48	2.911%
900	166	10.047%	181	10.955%	166	10.047%	181	10.955%	166	10.047%	181	10.955%
901	9	0.545%	9	0.545%	9	0.545%	9	0.545%	9	0.545%	9	0.545%
902	56	3.389%	56	3.389%	56	3.389%	56	3.389%	56	3.389%	56	3.389%
903	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
904	7	0.424%	7	0.424%	7	0.424%	7	0.424%	7	0.424%	7	0.424%
905	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
906	151	9.139%	138	8.352%	151	9.139%	138	8.352%	151	9.139%	138	8.352%
907	70	4.237%	35	2.118%	70	4.237%	35	2.118%	70	4.237%	35	2.118%
908	0	0.000%	33	1.997%	0	0.000%	33	1.997%	0	0.000%	33	1.997%
909	650	39.341%	467	28.265%	650	39.341%	467	28.265%	650	39.341%	467	28.265%
910	0	0.000%	157	9.502%	0	0.000%	157	9.502%	0	0.000%	157	9.502%
911	20	1.211%	20	1.211%	20	1.211%	20	1.211%	20	1.211%	20	1.211%
912	17	1.029%	30	1.816%	17	1.029%	30	1.816%	17	1.029%	30	1.816%
913	13	0.787%	0	0.000%	13	0.787%	0	0.000%	13	0.787%	0	0.000%
914	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
915	175	10.592%	201	12.166%	175	10.592%	201	12.166%	175	10.592%	201	12.166%
	1652	100%	1652	100%	1652	100%	1652	100%	1652	100%	1652	100%

MSOA	Code	Outbound	Inbound
Blackburn with Darwen 001	E02002615	3	3
Blackburn with Darwen 003	E02002617	3	3
Blackburn with Darwen 006	E02002620	7	7
Blackburn with Darwen 008	E02002622	3	3
Blackburn with Darwen 009	E02002623	3	3
Blackburn with Darwen 010	E02002624	4	4
Blackburn with Darwen 011	E02002625	5	5
Blackburn with Darwen 013	E02002627	1	1
Blackburn with Darwen 014	E02002628	2	2
Blackburn with Darwen 016	E02002630	1	1
Blackburn with Darwen 017	E02002631	1	1
Bolton 004	E02000987	2	2
Bolton 007	E02000990	2	2
Bolton 014	E02000997	1	1
Bolton 016	E02000999	1	1
Bolton 021	E02001004	1	1
Bolton 022	E02001005	1	1
Bolton 031	E02001014	1	1
Bolton 034	E02001017	1	1
Burnley 003	E02005178	7	7
Burnley 004	E02005179	1	1
Burnley 010	E02005185	2	2
Burnley 011	E02005186	2	2
Bury 006	E02001024	1	1
Bury 008	E02001026	1	1
Bury 009	E02001027	1	1
Bury 016	E02001034	1	1
Calderdale 008	E02002251	2	2
Calderdale 022	E02002265	1	1
Chorley 002	E02005190	7	7
Chorley 006	E02005194	17	17
Chorley 008	E02005196	0	15
Chorley 009	E02005197	1	1
Chorley 010	E02005198	16	16
Chorley 014	E02005202	1	1
Craven 006	E02005747	1	1
Hyndburn 002	E02005213	2	2
Hyndburn 003	E02005214	6	6
Hyndburn 004	E02005215	1	1
Hyndburn 005	E02005216	2	2
Hyndburn 006	E02005217	1	1
Hyndburn 008	E02005219	2	2
Hyndburn 009	E02005220	1	1
Leeds 071	E02002400	1	1
Manchester 006	E02001050	1	1
Manchester 022	E02001066	1	1
Manchester 044	E02001088	2	2
Manchester 052	E02001096	1	1
Manchester 053	E02001097	2	2
Oldham 028	E02001125	1	1
Pendle 005	E02005244	1	1
Pendle 007	E02005246	1	1
Pendle 009	E02005248	1	1
Pendle 011	E02005250	1	1
Rochdale 019	E02001150	1	1
Rossendale 003	E02005280	1	1
Rossendale 004	E02005281	1	1
Salford 001	E02001157	1	1
Salford 004	E02001160	1	1
Salford 009	E02001165	1	1
Salford 020	E02001176	1	1
Salford 021	E02001177	3	3
Salford 022	E02001178	5	5
Salford 028	E02001184	3	3
Stockport 007	E02001193	1	1
Stockport 016	E02001202	1	1
Stockport 025	E02001211	1	1
Tameside 014	E02001242	1	1
Trafford 006	E02001264	4	4
Trafford 022	E02001280	1	1
Wigan 004	E02001290	1	1
Wigan 012	E02001298	1	1
Wigan 013	E02001299	1	1
Wigan 024	E02001310	1	1
Wigan 027	E02001313	1	1
Wigan 030	E02001316	1	1
		166	181

MSOA	Code	Outbound	Inbound
Chorley 001	E02005189	6	6
Chorley 004	E02005192	3	3
		9	9

MSOA	Code	Outbound	Inbound
Cheshire East 007	E02003859	1	1
Chorley 013	E02005201	3	3
Flintshire 009	W02000066	1	1
Halton 012	E02002585	1	1
Knowsley 005	E02001331	2	2
Liverpool 001	E02001347	2	2
Liverpool 058	E02001404	1	1
Liverpool 060	E02006932	1	1
Liverpool 062	E02006934	1	1
Sefton 018	E02001446	1	1
Sefton 020	E02001448	1	1
Sefton 025	E02001453	1	1
Sefton 037	E02001465	1	1
St. Helens 005	E02001410	3	3
Stoke-on-Trent 020	E02002970	1	1
Trafford 024	E02001282	1	1
Warrington 003	E02002592	1	1
Warrington 004	E02002593	5	5
Warrington 005	E02002594	2	2
Warrington 006	E02002595	1	1
Warrington 009	E02002598	1	1
Warrington 018	E02002607	3	3
Warrington 024	E02002613	3	3
West Lancashire 005	E02005308	2	2
West Lancashire 008	E02005311	1	1
West Lancashire 010	E02005313	2	2
West Lancashire 015	E02005318	1	1
Wigan 001	E02001287	1	1
Wigan 005	E02001291	1	1
Wigan 006	E02001292	2	2
Wigan 014	E02001300	1	1
Wigan 015	E02001301	2	2
Wigan 032	E02001318	2	2
Wigan 034	E02001320	3	3
		56	56

MSOA	Code	Outbound	Inbound
Chorley 003	E02005191	7	7
		7	7

MSOA	Code	Outbound	Inbound
Chorley 005	E02005193	4	4
Chorley 007	E02005195	15	15
Chorley 008	E02005196	15	0
Chorley 011	E02005199	4	4
South Ribble 013	E02005299	32	32
South Ribble 014	E02005300	39	39
South Ribble 015	E02005301	21	21
South Ribble 016	E02005302	11	11
South Ribble 017	E02005303	10	10
West Lancashire 007	E02005310	0	2
		151	138

MSOA	Code	Outbound	Inbound
Sefton 004	E02001432	2	0
Sefton 005	E02001433	1	0
Sefton 006	E02001434	1	0
Sefton 008	E02001436	1	0
Sefton 011	E02001439	1	0
South Ribble 010	E02005296	35	35
South Ribble 011	E02005297	10	0
West Lancashire 001	E02005304	9	0
West Lancashire 002	E02005305	6	0
West Lancashire 004	E02005307	2	0
West Lancashire 007	E02005310	2	0
		70	35

MSOA	Code	Outbound	Inbound
Sefton 004	E02001432	0	2
Sefton 005	E02001433	0	1
Sefton 006	E02001434	0	1
Sefton 008	E02001436	0	1
Sefton 011	E02001439	0	1
South Ribble 011	E02005297	0	10
West Lancashire 001	E02005304	0	9
West Lancashire 002	E02005305	0	6
West Lancashire 004	E02005307	0	2
		0	33

MSOA	Code	Outbound	Inbound
Blackpool 004	E02002636	2	2
Blackpool 008	E02002640	2	2
Blackpool 009	E02002641	10	10
Blackpool 010	E02002642	6	6
Blackpool 012	E02002644	1	1
Blackpool 013	E02002645	3	3
Blackpool 014	E02002646	7	7
Blackpool 016	E02002648	1	1
Blackpool 018	E02002650	5	5
Blackpool 019	E02002651	1	1
Fylde 001	E02005203	11	11
Fylde 002	E02005204	10	10
Fylde 003	E02005205	13	13
Fylde 004	E02005206	2	2
Fylde 005	E02005207	3	3
Fylde 006	E02005208	2	2
Fylde 007	E02005209	63	63
Fylde 008	E02005210	3	3
Fylde 009	E02005211	7	7
Preston 002	E02005254	7	7
Preston 003	E02005255	8	8
Preston 005	E02005257	4	4
Preston 006	E02005258	27	27
Preston 007	E02005259	28	28
Preston 008	E02005260	6	6
Preston 009	E02005261	26	0
Preston 010	E02005262	61	61
Preston 011	E02005263	20	20
Preston 012	E02005264	71	71
Preston 013	E02005265	16	16
Preston 014	E02005266	27	27
Preston 015	E02005267	28	28
Preston 017	E02005269	157	0
Wyre 003	E02005321	2	2
Wyre 009	E02005327	2	2
Wyre 010	E02005328	1	1
Wyre 011	E02005329	2	2
Wyre 012	E02005330	1	1
Wyre 013	E02005331	4	4
		650	467

MSOA	Code	Outbound	Inbound
Preston 017	E02005269	0	157
		0	157

MSOA	Code	Outbound	Inbound
Preston 016	E02005268	20	20
		20	20

MSOA	Code	Outbound	Inbound
South Ribble 004	E02005290	17	17
South Ribble 002	E02005288	0	13
		17	30

MSOA	Code	Outbound	Inbound
South Ribble 002	E02005288	13	0
		13	0

MSOA	Code	Outbound	Inbound
Blackburn with Darwen 004	E02002618	1	1
Lancaster 005	E02005225	5	5
Lancaster 010	E02005230	2	2
Lancaster 013	E02005233	1	1
Lancaster 014	E02005234	2	2
Lancaster 016	E02005236	1	1
Lancaster 018	E02005238	1	1
Lancaster 019	E02005239	3	3
Lancaster 020	E02006871	2	2
Preston 001	E02005253	9	9
Preston 004	E02005256	92	92
Preston 009	E02005261	0	26
Ribble Valley 002	E02005271	4	4
Ribble Valley 006	E02005275	5	5
Ribble Valley 007	E02005276	3	3
Ribble Valley 008	E02005277	38	38
South Lakeland 003	E02004017	1	1
Wyre 006	E02005324	3	3
Wyre 007	E02005325	2	2
		175	201

Zone	MSOA	Trips	Percent	Adjusted Trips
200	South Ribble 005	26	25%	7
201	South Ribble 006	34	15%	5
202	South Ribble 012	74	5%	4
203	South Ribble 012	74	15%	11
204	South Ribble 008	82	60%	49
205	South Ribble 008	82	10%	8
206	South Ribble 008	82	15%	12
207	South Ribble 005	26	40%	10
300	South Ribble 001	35	50%	18
301	South Ribble 003	28	40%	11
302	South Ribble 003	28	20%	6
303	South Ribble 001	35	50%	18
304	South Ribble 005	26	5%	1
305	South Ribble 006	34	15%	5
306	South Ribble 005	26	5%	1
307	South Ribble 009	23	10%	2
308	South Ribble 009	23	15%	3
309	South Ribble 009	23	10%	2
400	South Ribble 005	26	25%	7
401	South Ribble 006	34	60%	20
402	South Ribble 009	23	15%	3
403	South Ribble 009	23	15%	3
404	South Ribble 009	23	15%	3
405	South Ribble 009	23	20%	5
407	South Ribble 008	82	15%	12
408	South Ribble 003	28	40%	11
409	South Ribble 012	74	5%	4
410	South Ribble 007	27	100%	27
411	South Ribble 012	74	65%	48

Appendix D - Model Specification Report

vectos microsim.

MODEL SPECIFICATION REPORT

South Ribble Microsim

Model Specification Report

June 2021

South Ribble MSR

vectos.co.uk

Contents

Figures

Tables

1 Introduction

1.1 The Model Specification Report (MSR) has been produced by Vectos on behalf of Taylor Wimpey to set out the principles behind the development of a Paramics Discovery Microsimulation model of South Ribble, Lancashire.

1.2 The purpose of the model is to support the assessment of highway network operation following the inclusion of the the proposed 'The Lanes, Penwortham' residential led development adjacent to the A582 Penwortham Way.

1.3 The proposed model captures the A59, A582, A6 and M6 Junction 29, encompassing the Lower Penwortham and Lostock Hall area, to the south of Preston.

1.4 The intention of the model is to provide a suitable tool to be used to assess the operation of the highway network and consider the effects of the proposed residential development located south-east of Penwortham town centre.

1.5 To inform the modelling, extensive traffic surveys have been commissioned and used to inform the development of the Base model. This MSR outlines the proposed network coverage, the survey data collected, and the key assumptions, specifications and methodologies relating to the Base model development.

1.6 The MSR has been produced in accordance with TAG Unit M3.1 Highway Assignment Modelling, Appendix F. The purpose of this MSR is to set out, and seek agreement between all parties on the principles behind the proposed approach, in advance of undertaking any detailed microsimulation modelling.

2 Scope and Design Considerations

Background

2.1 'The Lanes, Penwortham', a residential-led development, has been proposed east of Penwortham Way, 6.4km to the south of Preston City Centre. The development has been proposed to deliver 1,350 dwellings along with a primary school, shops, health facilities, a Community Centre and an Apprenticeship and Skills Centre.

2.2 It is recognised that an existing assessment of the development impacts related to the development site has been undertaken using isolated junction models. However, it is also understood that the use of the isolated junction models alone is not considered to provide sufficient evidence of the wider impacts of the development proposals.

2.3 On this basis, a microsimulation model is being developed to provide wider coverage and bring with it a plethora of benefits to ensure the development is assessed, and the impact quantified, in a robust and transparent fashion.

Model Objectives

2.4 Based upon information received thus far, Vectos understand that the following objectives will be required to be met through this modelling exercise:

- Development of a wide area microsimulation model of South Ribble, which can determine the impacts of changes in traffic volumes on the highway network cognisant of network capacity as well as prospective changes in driver behaviour in the future.
- Enable The Lanes development impacts to be considered in the context of existing and future traffic levels.
- Provide a detailed analysis of the function of the transport network inclusive of effects such as the interaction between junctions as well as providing an assessment of how temporal changes may also influence network operation.

Model Development Considerations

2.5 Before the impact of the proposed development can be assessed, it is imperative that the baseline position, in terms of existing highway capacity and congestion, is established. This is particularly important given the local concerns, the nature of the network itself, and the proximity to the Strategic Road Network.

2.6 Furthermore, this assessment is expected to use network capacity as a benchmark for the appropriate level of traffic to be accommodated within the confines of the existing network layout. It is therefore essential that the tool selected reflects capacity in as much detail as it possible.

2.7 Microsimulation provides the ideal tool to ensure that the wider effects of traffic on the local network are captured and that the existing conditions are accurately reflected. The road user's behaviours and responses to changes will be based on their current behaviours and response to the current conditions, so this will be explicitly calibrated into the Base model.

2.8 Vectos understand that a previous modelling assessment has been undertaken with regards to this development site, which focused on the use of standalone junction modelling to support the work. Given that this latest assessment now seeks to move away from the previous 'predict and provide' methodology, towards a 'vision and validate' approach, there is a need to move away from isolated junction models to support this.

2.9 On this basis the development of a microsimulation model is intended to enable the assessment of the traffic impact in the traditional peak hours, along with over a 12 hour period across the day, but also to move away from a simple pass/fail exercise that has historically been relied upon. The use of a microsimulation model for the South Ribble area will enable further interrogation specific route journey times (e.g. on the A582 Penwortham Way and Leyland Road), which Vectos believe is a key metric when seeking to determine the residual cumulative impacts on the local road network.

2.10 Therefore, Vectos consider that the development of a microsimulation model would be beneficial insofar as it would address the need to include reassignment effects within the assessment at the same time as allowing the detailed operation of junctions to be considered across the study area, allowing for driver responses to changes in the network layout to be estimated through the modelling.

2.11 A review of the network and the routing options within the South Ribble area, has reinforced the decision to develop a microsimulation model. The benefits that such a model offers over the traditional junction assessment software packages are summarised below:

- Added network detail can be included in the models that cannot be reflected as accurately in traditional standalone junction modelling software, or in the larger Strategic models
- The effects of traffic calming, narrow streets, pedestrian crossings, and signal junctions in close proximity to one another can be captured in the Base model. This is particularly important given the urban and residential nature of many of the roads to be modelled.
- The capacity and behavioural responses to features such as yellow boxes, zebra crossings or narrow lanes where vehicles give way to oncoming traffic. This ensures capacity isn't overestimated at junctions and that the result behaviour/routing is as observed on street.

2.12 Further to the above, the Origin to Destination (ODs) of trips is included explicitly within the microsimulation Base model. This ensures that the reassignment (as discussed above) is accurate, as the cost calculations that inform a trip's route choice will take into account the full route as opposed to simply a movement at an isolated junction. This also provides opportunity to filter the outputs and quantify the route choice of isolated zones and their assignment across the network. E.g. to review the route choices from the proposed site into Preston, and then report the proportion that selects each option across a series of alternative scenarios.

2.13 In addition to this the use of microsimulation offers advantages over strategic models, as it enable the interaction between junctions and road users to be captured accurately. Given the existing congestion on the key routes in this study area, this is extremely important if an accurate picture of the baseline conditions is to be captured.

2.14 Queues from one junction will often cause reduced throughput at an upstream junction. Similarly, the lane changing behaviour, as vehicles have to get into the correct lane as they move along a corridor, will have an impact on network operation and delay. An example is the A582/A6 roundabout, where queues and lane switching have the potential to block back through the A6/Cuerden Way signal junction. These are features that will be explicitly captured in the baseline model, as all junctions will be connected and the delay and vehicle behaviour will be calibrated and validated using observed data.

2.15 More detailed traffic inputs are required when developing a microsimulation model, which ensures that the outputs are more accurate and more tailored to the particular characteristics and behaviours observed within the study area. Vehicle compositions, release profiles and period specific signal times can all be accurately included based on survey data. This ensures the modelled network is reflective of on street conditions and varies, as it does in reality, across the modelled period. Traditional software assumes a more linear and more generalised set of inputs.

2.16 The use of the microsim also allows the network capacity to be considered in depth, and specifically related to this study, enables the network to be modelled over the entire day.

2.17 Furthermore, an extensive selection of model outputs are available from a microsimulation model and therefore the outputs selected can be tailored to the specific purpose of the study or to answer specific questions. Traditionally the following outputs are interrogated:

- Network wide statistics - used to provide a high-level comparison between alternative scenarios, or alternatively, precise queue lengths on a single approach to a single junction can be used to review junction performance.
- Impacts on average journey times between point A and point B can be extracted to highlight the benefit of, for example, a change in proposed signage strategy or to quantify the benefit of a capacity enhancement at a key junction on this route.
- The outputs can latterly be used to inform Air Quality assessments (as each individual's dynamics are recorded) or for economic assessments.

2.18 A microsimulation model provides a visual display, which is particularly useful if alternative routing strategies are assessed or there are proposed network alterations. All stakeholders can quickly see the effects of the proposals and understand where the issues occur or where the benefits are shown. This enables non-technical stakeholders to be involved in the iterative testing, which is key to ensuring what may be the most appropriate solution is not overlooked.

2.19 On the basis of the considerations outlined above, the application of microsimulation modelling is considered appropriate. It is therefore proposed that a microsimulation model be developed using the latest version of Paramics Discovery, currently version 24.

3 Model Standards

Model Calibration and Validation

3.1 It is proposed that the model will be developed in line with the standards outlined within TAG Unit M3.1 – Highway Assignment Modelling. These are considered an appropriate guide to determining the accuracy with which the model reflects the traffic volumes within the modelled network.

Calibration

3.2 Model calibration will be undertaken using both link and turn flows at all key junctions where data has been collected. The calibration standards for the model link flows will be adopted as follows:

Table 1 Model Calibration Criteria

Criteria	Description of Criteria	Acceptability Guidelines
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	85% of cases
2	GEH <5 for individual flows	85% of cases

Validation

3.3 Model validation will be undertaken using observed journey time data. Observed journey time data that captures the delay across a sample of key routes through the network will be provided by Streetwise TomTom and used to validate journey times in the model. The assessment of modelled versus observed average journey times will be presented for each individual segment along the route and for the route as a whole.

3.4 When using the journey time data for validation purposes the TAG will be followed. TAG Unit M3.1 states that a model can be considered as valid if the modelled journey times are within 15% or 60 seconds of the observed journey times whichever is greater.

Other Considerations during Cal/Val

Model Runs

3.5 The model outputs used for calibration and validation purposed will be based on at least 10 random seed runs, with the average values used to compare against the observed data sets. The final number will be determined through an assessment of the model stability.

Failed Runs

3.6 The model runs will be reviewed to ensure there are no outliers that would skew the average results. This will be ascertained through a review of the vehicles on the network throughout the simulation period and at the end of the simulation period. This will provide a picture of the average profile of congestion on the network at any point and will highlight if any single run is significantly different.

3.7 In the unlikely event that there are infrequent ‘failed’ runs then these runs will be excluded. The success rate, indicating model stability, will be provided in the Validation Report alongside benchmark model statistics against which future scenarios can be compared.

4 Model Specification

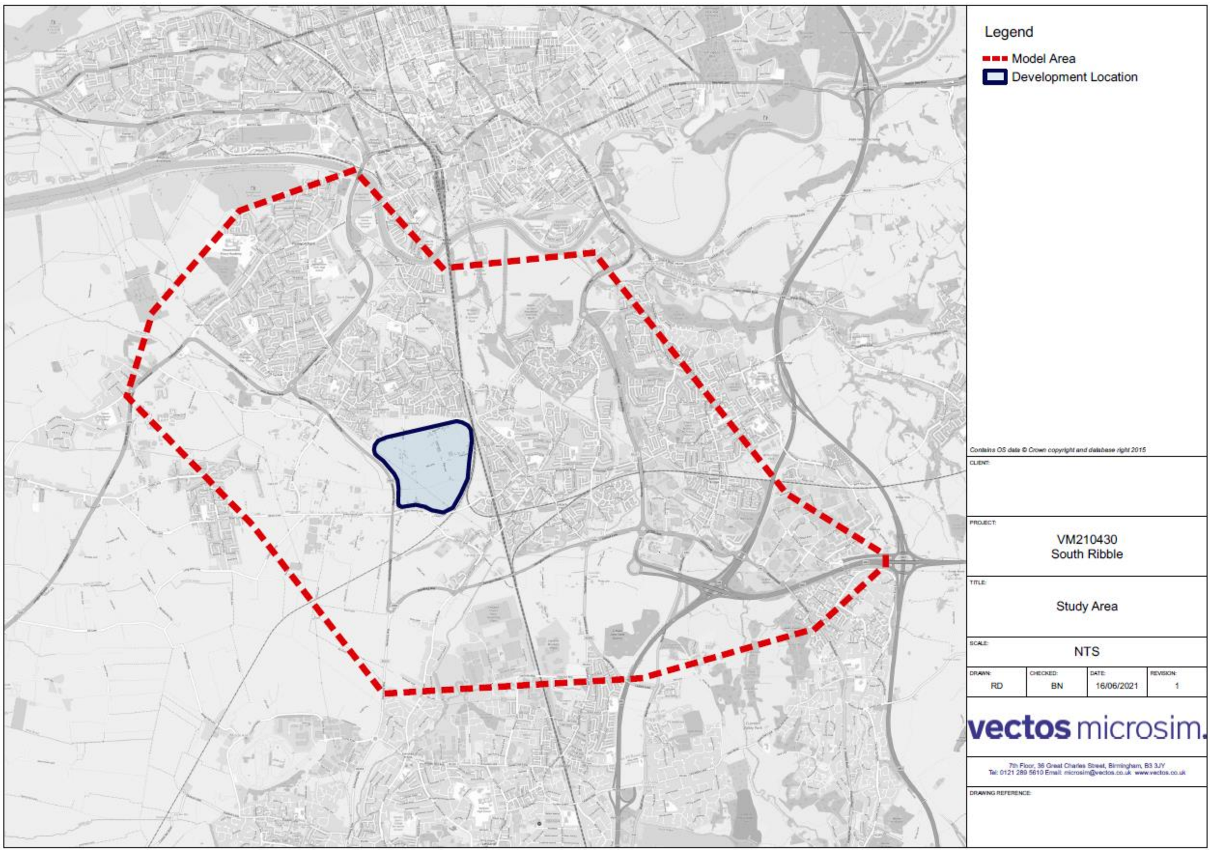
Study Area

4.1 The study area for the proposed microsimulation model has been defined by the key routing points between the primary roads surrounding the proposed development site.

4.2 The network extent proposed captures the A59, A582, A6 and M6 Junction 29. The network also captures the centre of Lostock Hall and residential areas around Lower Penwortham. It is envisaged that detailed model coding of each of the key junctions along the routes listed above will be included within the model.

4.3 The proposed network coverage has been reviewed to ensure all key traffic considerations are include both now and in the future year scenarios. The resultant proposed network extent is presented within Figure 1.

Figure 1 Study Area



Network & Zones

4.4 The model network will be coded based upon the available road OS information and checked against aerial imagery.

4.5 Vectos will also rely heavily on site surveys to understand both the network conditions and to obtain a snapshot of the network operation. Site visits will be undertaken during both the AM and PM peak periods to gain an appreciation of the delay on the key corridors but also to observe junction operation and the typical driver behaviour.

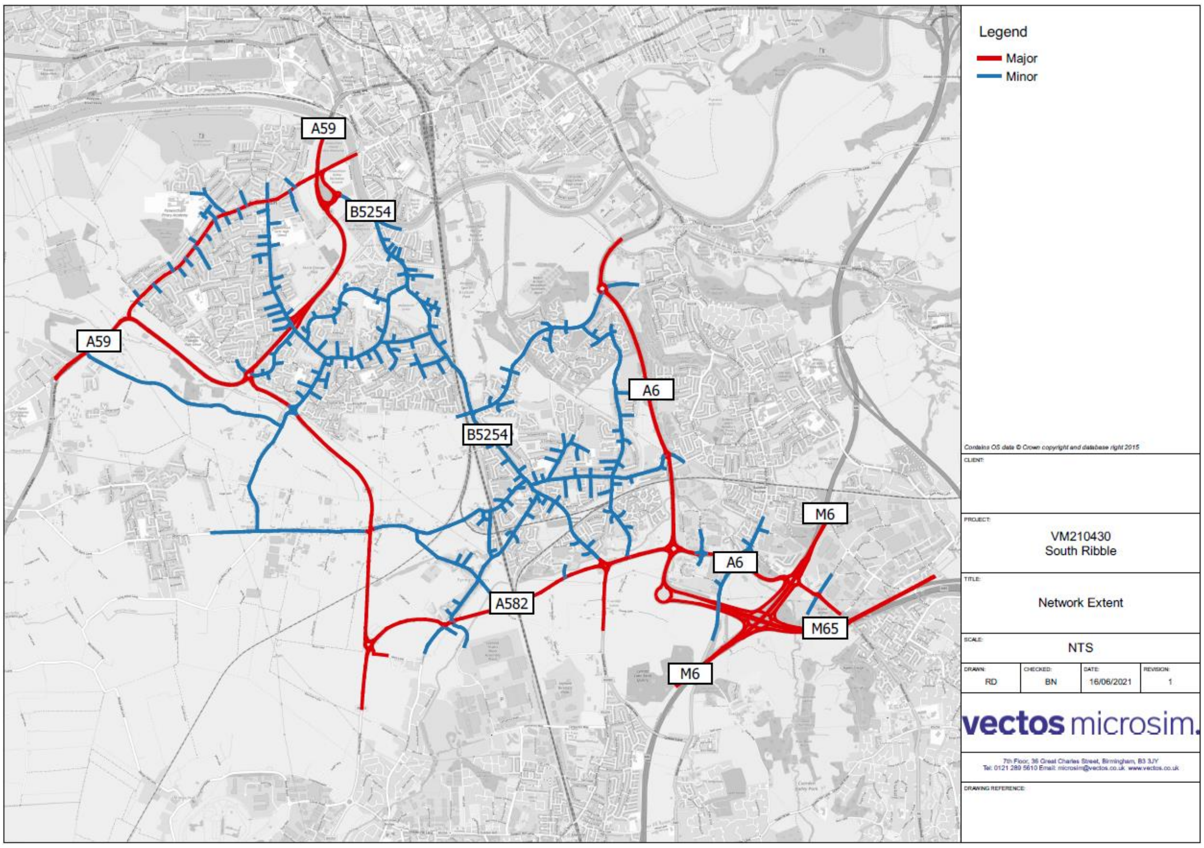
4.6 The model network will be coded using the Paramics Highway and Urban classifications and, in the majority of instances, the current speed limits will be used to define the speeds on the links. Exceptions to this may be made in more built up areas such as Penwortham Town centre, where speeds may be dropped below the speed limit, alongside other calibration parameters such as end speeds and/or cost factors, to reflect constraints such as a prevalence of parked cars, narrow lanes and traffic calming. If this is the case it will be documented in the Validation Report.

4.7 The zones defined at the links where vehicles first interact with the model network will reflect external loading points. Within the inner area the zones derivation will adopt a strategy that defines areas by Residential and Employment land uses. This will assist when developing the demand matrices and provide guidance on the trip ends when utilising Census data. The zone system will likely evolve as the network is developed.

4.8 The routeing will also be controlled by the signposting options that are available within the Paramics software with the internal routes being classified as minor (meaning that the cost of using the routes will be perceived as double for unfamiliar drivers).

4.9 An indicative plan of the model network has been illustrated within the following Figure 2.

Figure 2 Model Network Plan



4.10 Figure 2 represents the core modelled area for which observed data has, or will be, collected for the purpose of the update.

Signalised Junctions

4.11 Vectos understand that there are a significant number of signalised junctions which form part of the model network.

4.12 As part of a formal data request, Vectos will seek confirmation from the highway authority as to the location of the key signalised junctions and, furthermore, an overview of the signal timings which should be included. In the absence of any available signal timings from the highway authority, Vectos will used standalone LinSig model outputs to guide the signal staging and timings where available.

4.13 Where signalised junctions operate under dynamic control, averages of the green times will be used in the first instances but, if necessary, signal plans will be used to replicate the cycling of the green times.

Pedestrian Crossings

4.14 Vectos have identified that there are likely to be a number of pedestrian crossing points which should be included within the model network.

4.15 Vectos will again seek confirmation from the highway authority as part of a formal data request on the locations of the key pedestrian crossings and whether any timing and frequency information is available to support the inclusion.

4.16 In the absence of any other data, Vectos will adopt a standardise approach to the inclusion of pedestrian crossings based on the following frequencies:

- High – 1 every 2 minutes
- Medium – 1 every 4 minutes

4.17 The frequency will be determined based on location with areas which are closer to retail zones and schools, and therefore likely to experience higher footfall, being allocated a higher call frequency. In each instance 10 seconds of green time will be assigned to the crossing.

Time Periods

4.18 It is proposed that the demands will be assigned using discreet hourly periods. It is acknowledged that Systra promote the use of larger periods (as opposed to discrete hours) and then the use of profiles to control release. However, Vectos prefers the use discrete hours for wide area models as this has provided more control over the model operation and allows more accuracy throughout matrix estimation and calibration. Furthermore, the future year testing will seek to consider the effects of network capacity during each hour. It is possible that the relative capacity in each hour may be used to determine how much traffic is assigned to the network within that hour. In such circumstances it is impossible to adopt this approach without the control afforded to the process as a result of the manipulation of discrete hourly assignment matrices.

4.19 Hourly Survey files and Prior Matrices can then be built enabling more accurate demand matrices to be developed, which are allowed the opportunity to reflect changes in distribution on an hourly basis across the period. Hourly vehicle compositions are also made possible, as are hour specific calibration (e.g. signal times, pedestrian frequencies, end speeds)

4.20 On that basis, the following periods are proposed to be modelled:

- Period 01 – 07:00 to 08:00 AM Pre Peak
- Period 02 – 08:00 to 09:00 AM Peak
- Period 03 – 09:00 to 10:00 AM Post Peak
- Period 04 – 10:00 to 11:00 Inter-peak 1
- Period 05 – 11:00 to 12:00 Inter-peak 2
- Period 06 – 12:00 to 13:00 Inter-peak 3
- Period 07 – 13:00 to 14:00 Inter-peak 4
- Period 08 – 14:00 to 15:00 Inter-peak 5
- Period 09 – 15:00 to 16:00 Inter-peak 6
- Period 10 – 16:00 to 17:00 PM Pre Peak
- Period 11 – 17:00 to 18:00 PM Peak
- Period 12 – 18:00 to 19:00 PM Post Peak

4.21 As a minimum, all hours will be subject to the WebTAG count calibration criteria which will therefore enable the impact assessment to account for shoulder and inter-peak hours, rather than just the peak hours.

4.22 Validation will likely focus on the peak and a selected inter-peak hour only.

User Classes

4.23 The different user classes within the model will be assigned to the network using individual vehicle types to represent the Light (Car & LGV) and Heavy (OGV1 & OGV2) user classes.

4.24 Each of the core user classes (lights and heavies) will be assigned within the model using separate matrix levels. The proportions will be calculated based on a sample of key junctions for which vehicle classifications will be aggregated and an overall proportion derived.

4.25 The proportions of each additional demand type, such as growth and development traffic, will be modelled explicitly using discrete vehicle types and separate matrix levels.

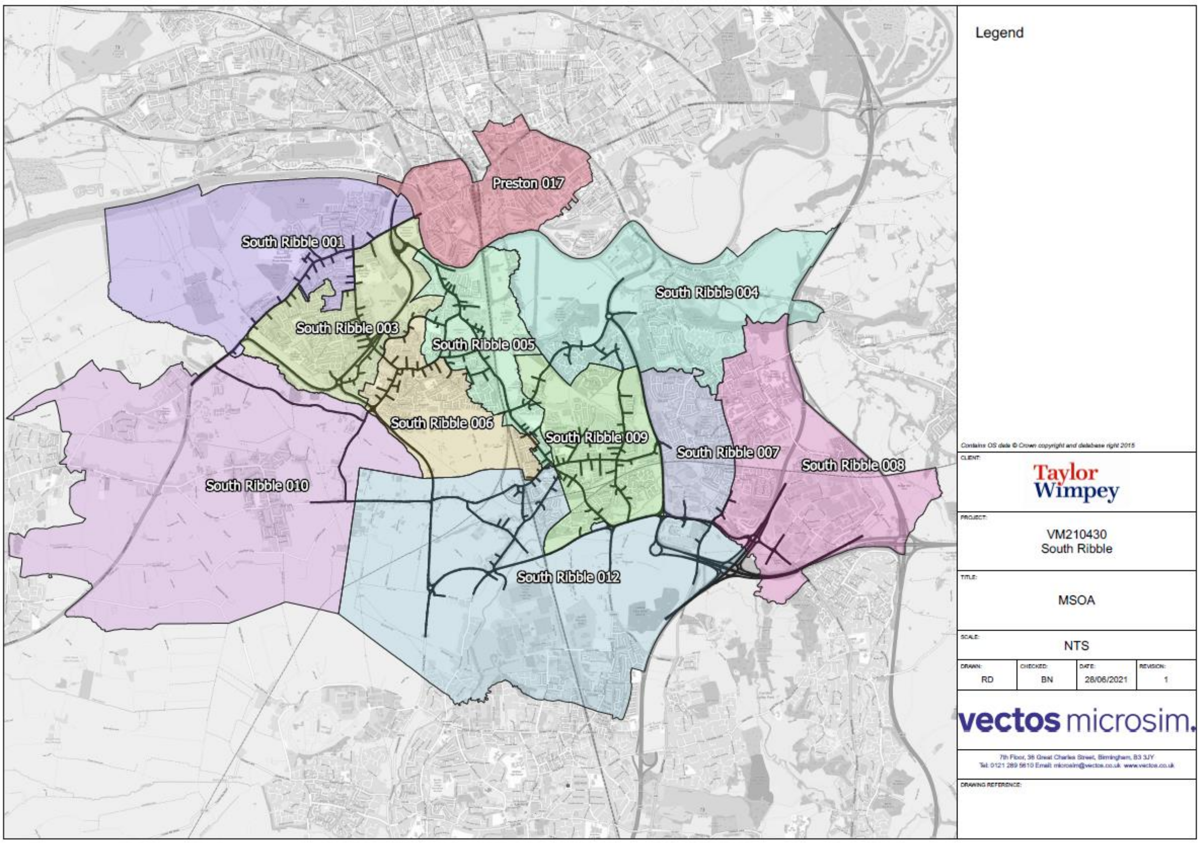
5 Calibration and Validation Data Specification

Matrix Development Data

5.1 An initial Prior matrix will be derived using Census data, which will inform the distribution between the defined zones. The nature of the network and the land use parcels within the study area lend itself to this method. The survey data and address point counts will be used to inform the trip-end volumes.

5.2 The Medium Super Output Areas (MSOA) within the study area will be identified to provide an initial trip distribution for the internal zones. The Travel to Work Census data for the MSOAs will be reviewed to ascertain the average distribution to/from this area. The External distribution will be informed primarily by surveyed traffic counts on the external junctions to the model. The MSOAs that make up the study area are demonstrated in Figure 3.

Figure 3 MSOAs within Study Area



5.3 Trip generation totals for the zones will be derived, where possible, from adjacent junction counts. Where count data does not exist then trip end totals will be approximated using estimated address point counts and standardised trip rates. The nature of the residential areas lends itself to this methodology and will be suitably accurate for the purpose of generating a Prior matrix.

5.4 The Prior matrices developed through the method summarised above will then be refined using the Paramics Matrix Estimation (ME) module.

5.5 Constraints will be used to:

— Prevent known movements / robust data in the prior matrix from changing significantly;

— Prevent ME from increasing unwanted trips / 'trip dumping' (e.g. short trips between adjacent zones); and

— To develop a robust ME process (e.g. by developing constraints based on trip type / prior matrix data sources).

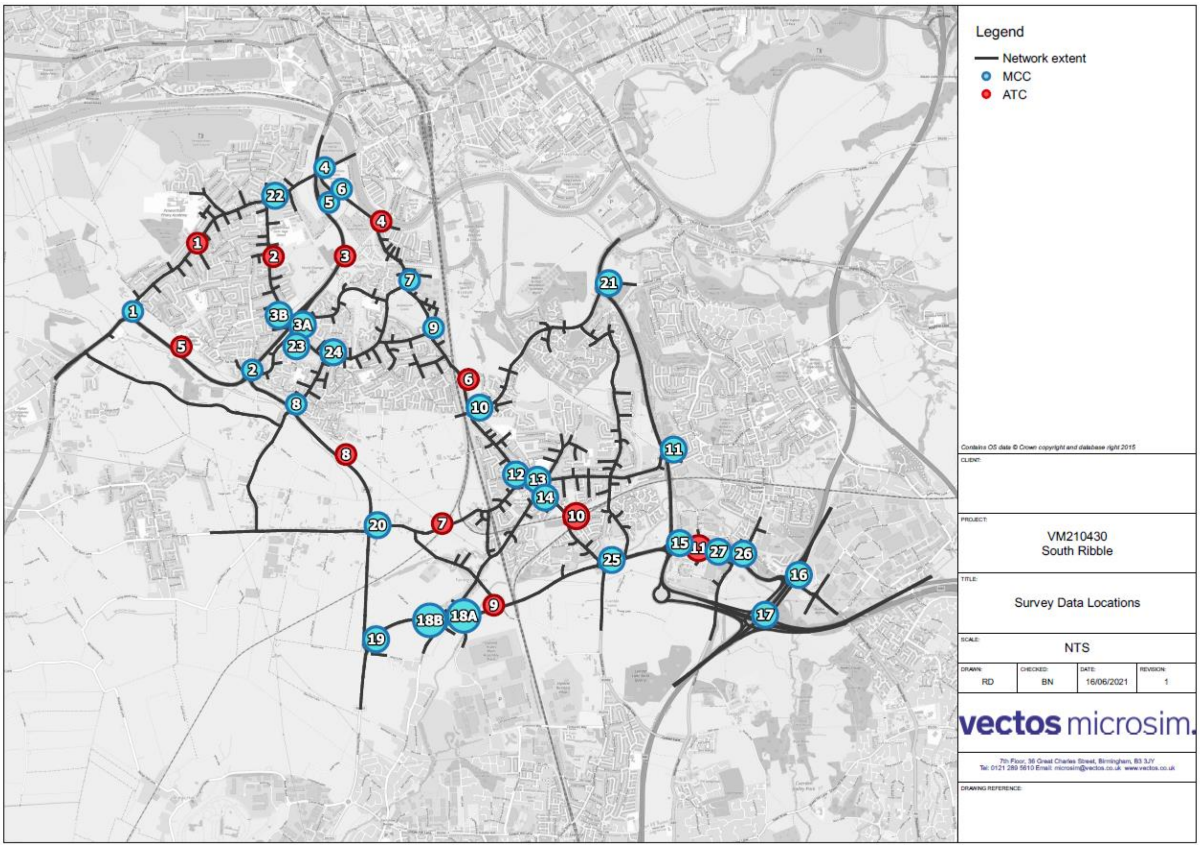
5.6 Routing files will be collected from the coded network in the form of Pija files for both the Light and Heavies demand sets.

5.7 The Prior matrices will then be refined using the targets provided in the Survey files containing the observed count data and the routing the network allows. Vectos believe that the use of MSOA information, coupled with the weighting that is available through the land use/trip type classifications to be undertaken, when added to the extensive survey data to be collected, negates the need for further routing information to be needed at this time.

Model Calibration

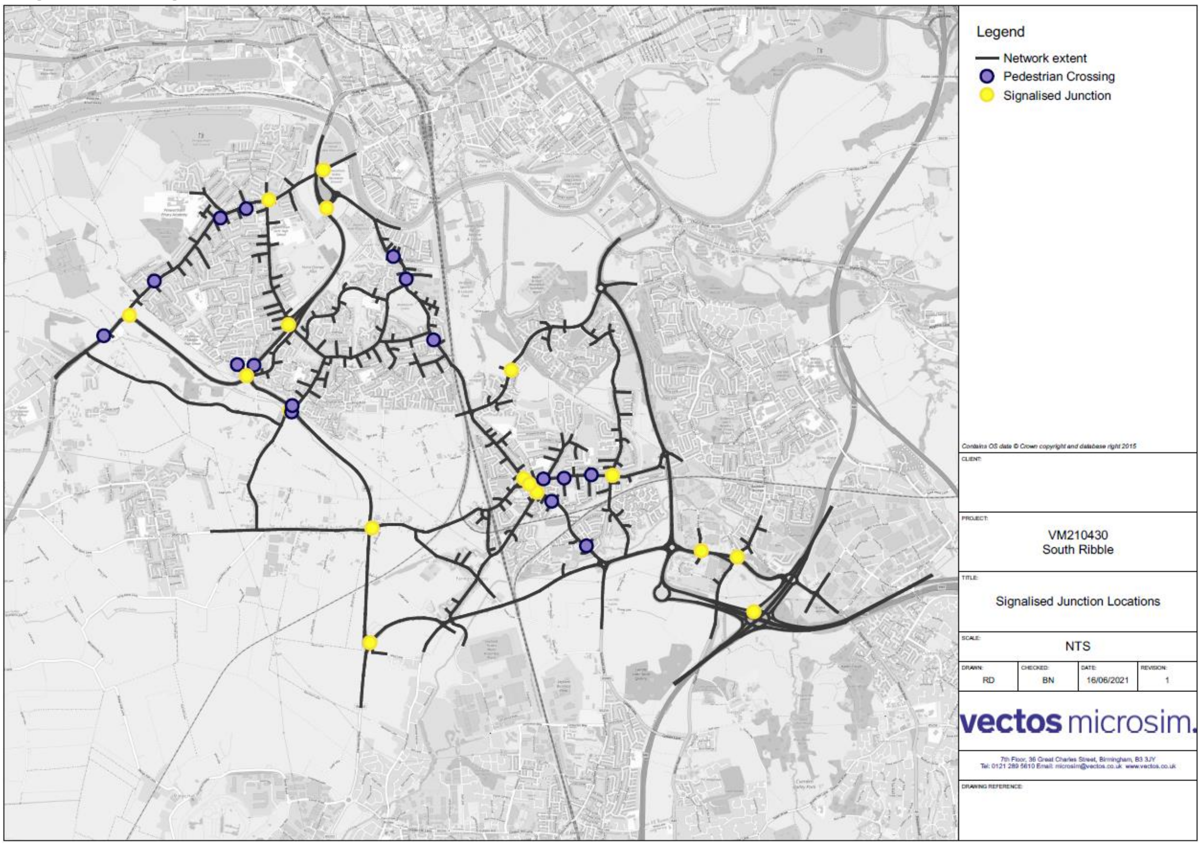
5.8 In order to develop a Base model that accurately reflects network conditions, all-movement turn counts, in the form of Manual Classified turn Counts (MCCs), and link counts, in the form of Automatic Traffic Counters (ATCs), will be collected. These observed counts will be used to assess network calibration. The following figure details the locations at which counts have been commissioned.

Figure 4 Survey Count Locations



5.9 Signalised junctions within the model area are shown in the following figure:

Figure 5 Signalised Junction Locations

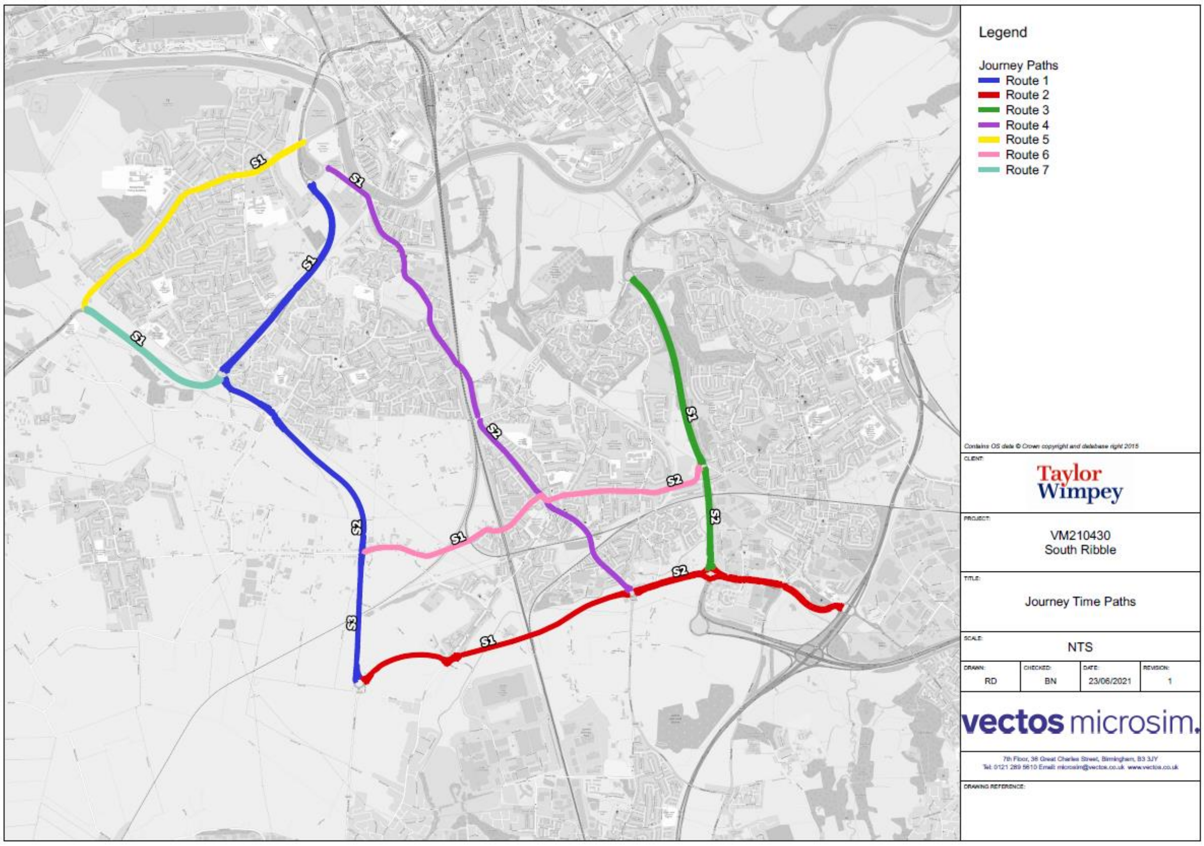


Model Validation Data

5.10 Since journey time validation is considered the most appropriate method of model validation it is proposed that Tom Tom journey time data will be used. These observed journey times can then be compared with any observed journey times recorded during the site surveys to supplement the validation process.

5.11 Figure 6 demonstrates the routes that Vectos consider are appropriate to validate against the journey time data.

Figure 6 Journey Time Validation Routes



5.12 ATC data not previously used for matrix development or calibration will be used to validate traffic flows.

5.13 Table 2 summarises the calibration and validation data sources to be used

Calibration

5.14 Model calibration will be undertaken using both link and turn flows at all key junctions where data has been collected. The calibration standards for the model link flows will be adopted as follows:

Table 2 Calibration and Validation Data Sources

Calibration Data Sources	Validation Data Sources
MCC Data	Journey Time data (Tom Tom)
ATC Data	ATC Data

6 Core Development Methodologies

Network Development Methodology

6.1 The Network will be developed using the latest OS information and the development will adopt the following methodology:

6.2 The network will be reviewed and refined to reflect the latest on-street layout;

6.3 Zones will be defined as per para 4.4 of this Report

6.4 Once demands have been assigned within the model network the model calibration will make use of all model development parameters including, but not constrained to, the following:

— Visibility

— Gap Acceptance

— Headway

— Cost Factors

— Sign Posting

Matrix Development Methodology

6.5 The matrix development methodology will make use of the available MCC and ATC count data which will be used to inform the input flows into the model and turn flows at the junctions.

6.6 A prior matrix will be manually derived based on the available count data with additional trip generation estimates to be included as a means of capping the trip generation levels associated with residential zones, and any other key trip attractors.

6.7 Matrices will be developed on a discrete hourly basis and will be profiled for each hour. Profiling will be calculated based on the survey data which Vectos understand has been collected in 15-minute intervals.

Assignment Parameters

6.8 The Paramics model will operate under the principles of dynamic assignment. In most instances the key assignment parameters will either be retained at the default values or within the standard ranges identified within the guidelines.

6.9 The Feedback Factor will be set within a range of 0.4 to 0.6 whilst the feedback interval will be retained at 2 minute intervals.

6.10 It is proposed that the Generalised Cost Equations applied within the Paramics model will be either calculated based on the inputs contained within the latest release of the TAG Data Book (May 2018 release).

6.11 For the Vehicle Operating Costs (VOC) an average speed across the network will be calculated using the journey time data to inform the average speeds input required in the calculations, and therefore ensuring the GCEs are tailored to the study area in question.

Reporting

6.12 Upon completion of the Base model development, the entire process will be summarised within a Local Model Validation Report (LMVR).

6.13 Vectos will prepare the LMVR in line with the guidance set out within TAG unit 3.1. Vectos will ensure that the LMVR contains useful GIS plots and figures presenting network characteristic (e.g. network hierarchy, the zone system and signal locations), calibration features (e.g. visibility, gap acceptance modifications and cost factors), and model outputs (e.g. network statistics and queue assessments).

6.14 Model calibration and validation levels will be confirmed by checking observed and modelled data in the form of link flows, turn counts, queuing observations and journey times. A spreadsheet will be used to summarise the information and, upon completion of the model development exercise, these spreadsheets will be made available, along with the model and Validation Report for review and sign off.

7 Summary of Model Development

Model Development

7.1 The model will be developed to reflect a base year of 2020 and will encompass the area outlined within Figure 2.

7.2 The model development will be supplemented with, where available, the following data sources:

- MCC's and ATCs;
- Signal time information; and
- Journey time data for the routes identified within Figure 6.

7.3 The model will be developed using discrete periods to cover each of the core assessment hours, namely:

- Period 01 – 07:00 to 08:00 AM Pre Peak
- Period 02 – 08:00 to 09:00 AM Peak
- Period 03 – 09:00 to 10:00 AM Post Peak
- Period 04 – 10:00 to 11:00 Inter-peak 1
- Period 05 – 11:00 to 12:00 Inter-peak 2
- Period 06 – 12:00 to 13:00 Inter-peak 3
- Period 07 – 13:00 to 14:00 Inter-peak 4
- Period 08 – 14:00 to 15:00 Inter-peak 5
- Period 09 – 15:00 to 16:00 Inter-peak 6
- Period 10 – 16:00 to 17:00 PM Pre Peak
- Period 11 – 17:00 to 18:00 PM Peak
- Period 12 – 18:00 to 19:00 PM Post Peak

7.4 The model will be validated to, as a minimum, to Journey Time data, extracted from the Tom Tom journey time database, for the following peak hours:

- 08:00 to 09:00 AM Peak hour
- 13:00 to 14:00 representative Inter-peak hour
- 17:00 to 18:00 PM Peak hour

7.5 This is considered the minimum level of validation that will be achieved. Further validation may be possible, through additionally available data, but this is not confirmed at this stage.

8 Conclusion & Further Considerations

8.1 The information set out within this MSR is intended to serve as a means of agreeing the principles of developing the Base model.

8.2 It is acknowledged that once the Base model has been developed, it will be necessary to produce forecast scenarios representative of future year conditions. Similar to this model specification report, a note setting out the principles of the forecasting will be made available in due course for review and comment.

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Appendix E - Local Model Validation Report

vectos microsim.

LOCAL MODEL VALIDATION REPORT

South Ribble Paramics Model

Local Model Validation Report

July 2021

VM210430 – South Ribble Paramics

Local Model Validation Report

Contents

Appendices

1 Introduction

1.1 Vectos has been commissioned by Taylor Wimpey to develop a microsimulation model of South Ribble, Lancashire. The model captures the A59, A582, A6 and M6 Junction 29, encompassing the Lower Penwortham and Lostock Hall area, to the south of Preston.

1.2 The purpose of the model is to support the assessment of highway network operation following the inclusion of the proposed 'The Lanes, Penwortham' residential led development adjacent to the A582 Penwortham Way.

1.3 This Local Model Validation Report (LMVR) describes the approach followed in developing the Base model, summarises the data utilised, and presents the calibration and validation results from the resulting model. The model has been developed in Paramics Discovery Version 24.

1.4 The original model and LMVR were submitted to Systra Ltd for audit in July 2021. An audit note was received from Systra in July 2021. The model and LMVR were subsequently revised in line with the audit recommendations and re-submitted to Systra for their final audit and model sign off, received on 23rd July 2021 (see **Appendix D**). This document is the revised LMVR and contains the outputs from the updated 2021 Base Model.

Study Objectives

1.5 Based upon information received thus far, Vectos understand that the following objectives have been set which this model will aim to address:

- Development of a wide area microsimulation model of the South Ribble area, which can determine the impacts of changes in traffic volumes on the highway network cognisant of network capacity as well as prospective changes in driver behaviour in the future
- Enable The Lanes development impacts to be considered in the context of existing and future traffic levels
- Provide a detailed analysis of the function of the transport network, inclusive of effects such as the interaction between junctions, as well as providing an assessment of how temporal changes may also influence the network operation

Purpose of Model

1.6 'The Lanes, Penwortham', a residential-led development, has been proposed east of Penwortham Way, 4.8km to the south-east of Penwortham town centre and 6.4km to the south of Preston City Centre. The development has been proposed to deliver 1,350 dwellings along with a primary school, shops, health facilities, a Community Centre and an Apprenticeship and Skills Centre.

1.7 In order that the effects of the development can be ascertained, it is proposed that a microsimulation model will be created to support the assessment of the proposals. The microsimulation model will enable the assessment of development to consider routing and assignment as well as the effects of traffic growth within a single model network.

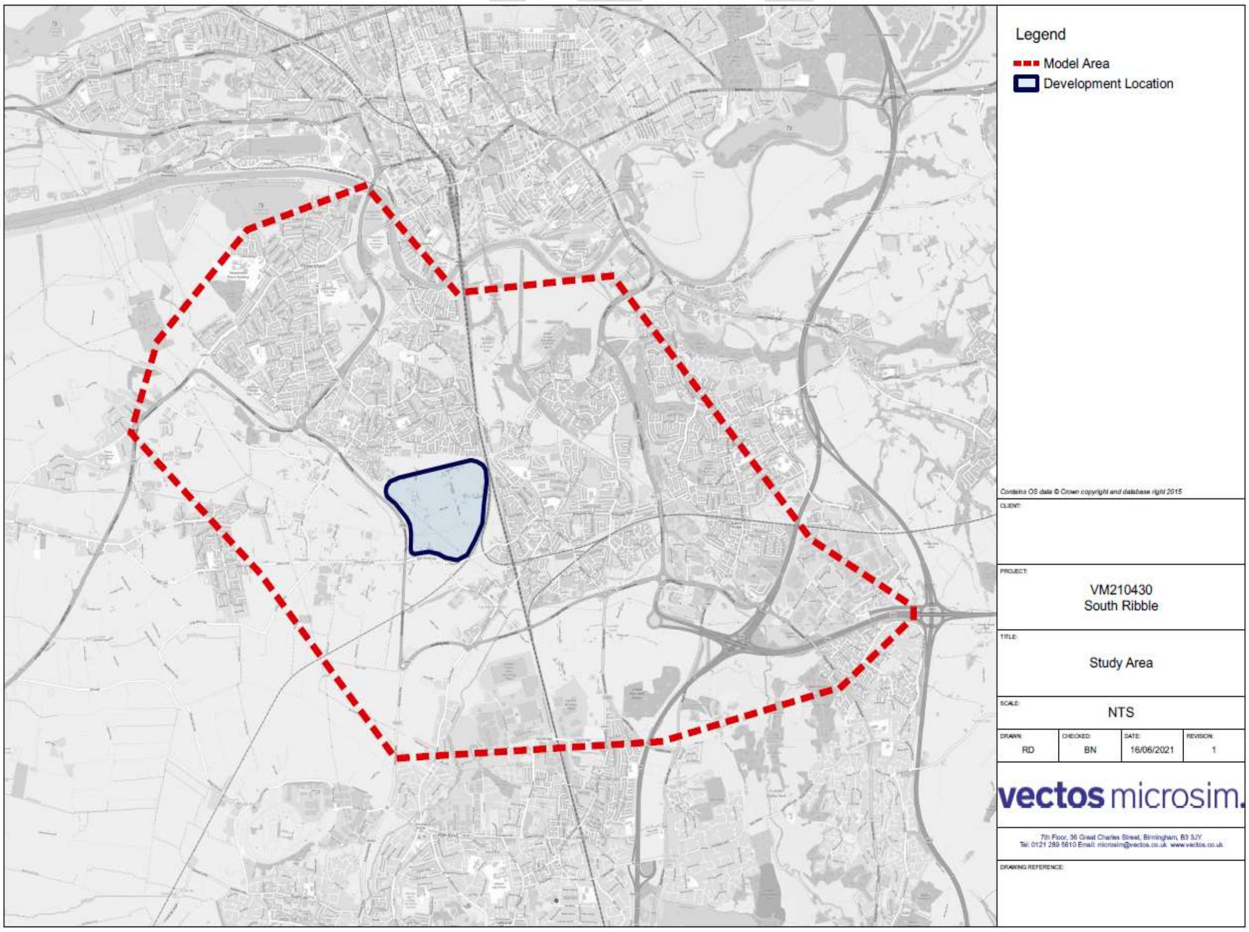
1.8 The microsimulation model will provide a wide coverage of the local area, and will bring with it a plethora of benefits to ensure the development is comprehensively assessed, and any impacts quantified, in a robust and transparent fashion. The purpose of this model is, therefore, to establish the effects of the development and its proposals using outputs from the model directly, and to provide a realistic estimate of the traffic flows through the local network, both with and without the development in place.

1.9 In utilising the Paramics model to predict the appropriate level of forecast demands and assignment characteristics, the intention is that any subsequent isolated junction assessments will be more sympathetic to the local network conditions than would otherwise be achieved via a manual assignment exercise. The Paramics model also allows differing assumptions to be tested so that the benefits of schemes can be established alongside the impacts of different development and growth forecasts.

Study Area

1.10 The study area for the proposed microsimulation model encompasses Lower Penwortham and Lostock Hall area, to the south of Preston. The network extent being proposed captures the A59, A582, A6, B5254 Leyland Road and M6 Junction 29. In addition to this any local arterial routes identified within the study area have also been included, eg. Chain House Lane, Coote Lane, Cop Lane and Pope Lane. The proposed network coverage has been reviewed to ensure all key traffic considerations will be included, both now and in the future. The network extent proposed is presented in **Figure 1**.

Figure 1 Study Area



Modelling Software

1.11 The model has been developed using Paramics Discovery version 24. A brief summary of the main features of Paramics are outlined in the following section.

Paramics Microsimulation

1.12 Paramics is a micro-simulation traffic modelling software that simulates the behaviour of each individual vehicle and presents its output as a real time visual display for traffic management and road network design.

1.13 Paramics allows a detailed representation of the highway network in the form of modelling of individual lanes, traffic signals, junctions, pedestrian crossings and bus stops as well as the events which occur on it. Each individual vehicle is separately represented and therefore the programme can take an account of each individual driver's behaviour.

1.14 The output is a visual display which shows the changing position of individual vehicles and queues on the highway network in real time. The advantage of a visual display enables the non-technical experts to view the results of highway and development proposals in terms of traffic flows and congestion

Driver and Vehicle Behaviour

1.15 The movement of individual vehicles within Paramics is governed by three interacting models representing vehicle-following, junction behaviour (gap acceptance) and lane-changing behaviour. All these three models are well documented in transport research and accepted world-wide.

1.16 Vehicle dynamics are relatively simple, combining a mixture of driver behaviour and some limitations based on vehicles' physical type and kinematics (e.g. size and acceleration/deceleration).

1.17 Individual driver behaviour is determined through the random allocation of aggression and awareness characteristics to the driver of each vehicle. Junction behaviour (gap acceptance), top speed, headway and propensity to change lanes are all examples of quantities that vary according to the behaviour parameters.

Road Network

1.18 Paramics is sensitive to the definition of the road network. The success of a model in reproducing the existing conditions and forecasting changes in travel behaviour is largely dependent on the accuracy in modelling the road layout and geometry. The speed of each vehicle is determined by the interaction between vehicles within the constraints imposed by the road layout.

Report Structure

1.19 This report comprises of the following chapters:

- **Chapter 2 – Observed Data**; an overview of the survey data that has been utilised and processing procedures.
- **Chapter 3 – Base Model Development**; an explanation of model parameters used.

- **Chapter 4 – Matrix Development**; an explanation of matrix development methodology and the Matrix Estimation process.
- **Chapter 5 – Network Calibration**; an explanation of model calibration parameters used.
- **Chapter 6 – Flow Calibration**; presentation of link flow calibration results.
- **Chapter 7 – Model Validation**; presentation of link flow and journey time validation results.
- **Chapter 8 – Summary and Conclusions**.

2 Observed Data

Model Calibration Data

2.1 Observed traffic data has been collected for the purpose of informing traffic volumes in the base model. The traffic surveys have been undertaken by Nationwide Data Collection (NDC), collected in April 2021.

2.2 In order to develop a base model that accurately reflects 2021 network conditions, all-movement turn counts, in the form of Manual Classified turn Counts (MCCs), and link counts, in the form of Automatic Traffic Counters (ATCs), have been collected.

2.3 A total of 27 junction counts and 11 link counts were used to inform the Matrix Estimation and model recalibration process. The survey sites provide sufficient coverage of the model extent to ensure the model is calibrated to a high level.

2.4 7-day ATC count data was collected from the week commencing Wednesday 21st April 2021. The MCC data was collected on Wednesday 21st April 2021.

2.5 All link counts were surveyed over 24 hours and the MCCs were surveyed over a 12-hour AM period (07:00 to 19:00).Both sets of count data were collected in 15 minute intervals. This level of disaggregation offers the opportunity to address any gaps in the zone profiling during the calibration process if necessary.

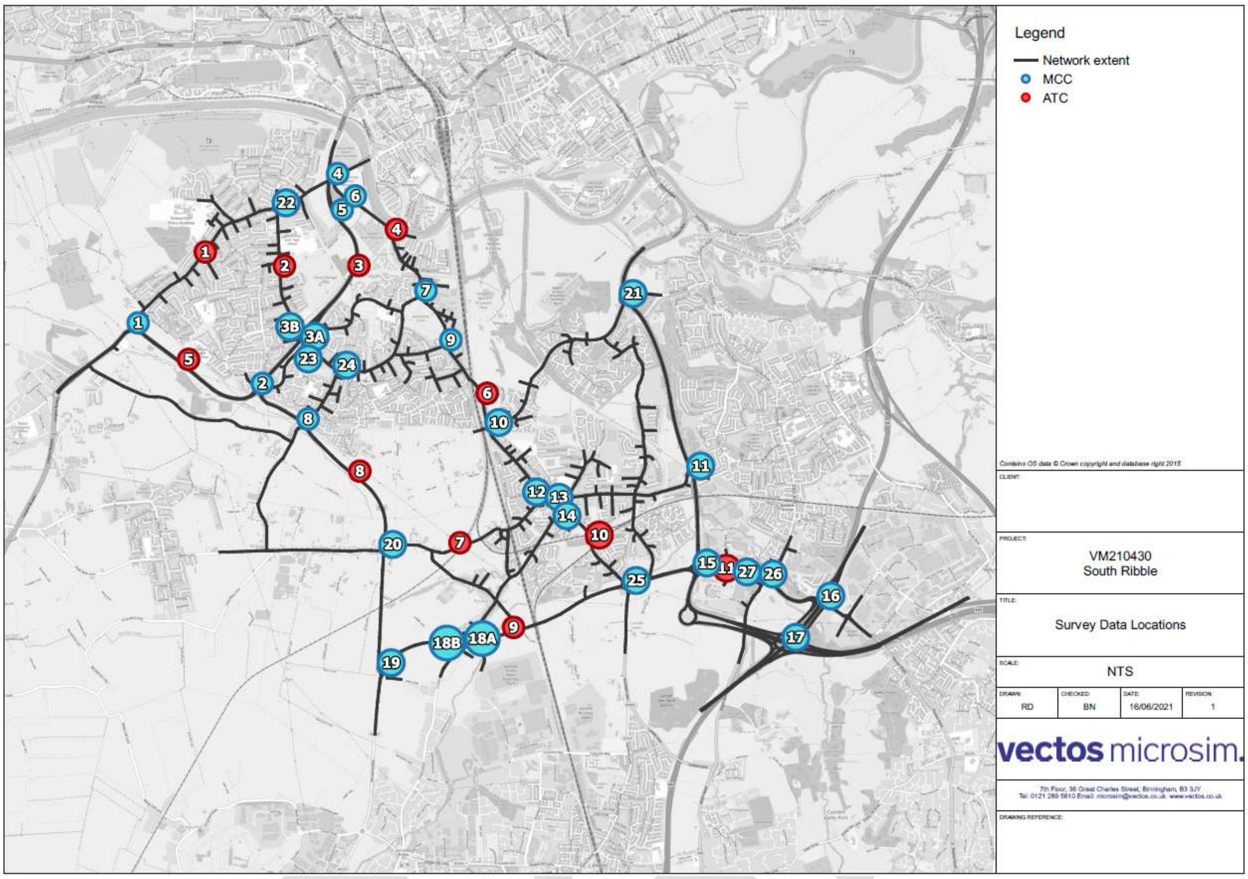
2.6 Using the survey data collected, two vehicle classifications were isolated for inclusion within the model. These are highlighted below:

- Car and LGV
- OGV1 and OGV2

2.7 These two classifications were used when interrogating the data for inclusion within the model in two discrete matrix levels.

2.8 The location of the ATC and MCC survey sites are shown in the following figure:

Figure 2 ATC and MCC Survey Locations



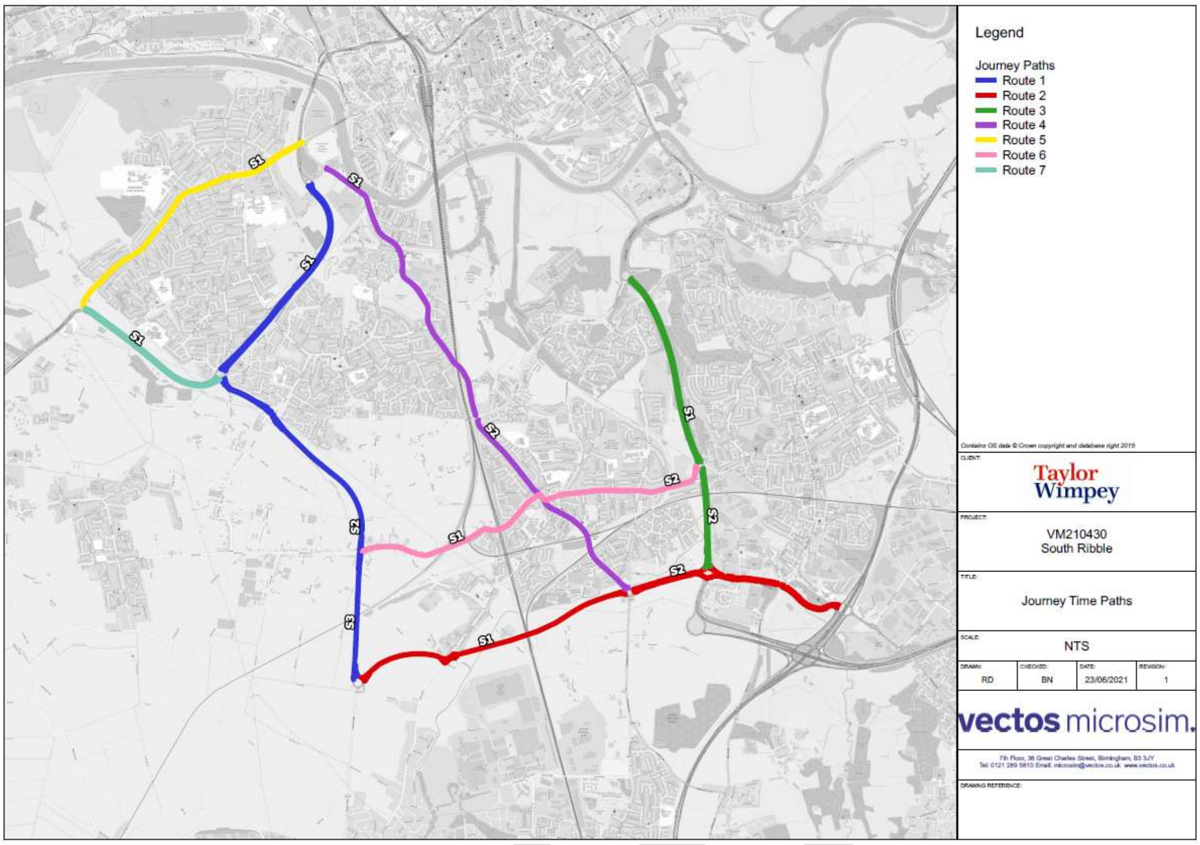
Model Validation Data

2.9 Journey time information has been used as the primary source of validation data for the model. Observed journey times were extracted from the Streetwise TomTom dataset for a selection of key corridors across the study area. The identified journey time routes are detailed within **Figure 3**.

2.10 For each defined section of each route, the path was matched with a corresponding journey time path within the Paramics model. This ensured a fair comparison was being made when assessing the modelled journey times against the observed data.

2.11 In determining the routes for analysis, it was considered that the key north/south and east/west movements through the study area would require capturing. Accordingly journey times have been interrogated on the A582 Penwortham Way, A59, A6, B5254 Leyland Road and Coote Lane/Brownedge Road

Figure 3 Journey Time Routes



3 Base Model Development

3.1 The following chapter summarises the model settings and network characteristic including the road hierarchy, link speeds, and link classification.

Version

3.2 The base model has been updated in the latest version of Paramics Discovery at the time which was Version 24.

Time Periods

3.3 The model has been developed to be inclusive of the AM (0700-1000) and PM (1600-1900) periods, as well as the six hour inter-peak period in between. The 12 hour model uses discreet hourly periods. The use of discreet hourly periods rather than AM and PM periods for wide area models is preferred by Vectos, as this provides more control over the model operation and allows increased accuracy throughout Matrix Estimation and calibration

3.4 This has resulted in the following demand sets included in the base model:

- **AM1:** 07:00 to 08:00
- **AM2:** 08:00 to 09:00
- **AM3:** 09:00 to 10:00
- **IP1:** 10:00 to 11:00
- **IP2:** 11:00 to 12:00
- **IP3:** 12:00 to 13:00
- **IP4:** 13:00 to 14:00
- **IP5:** 14:00 to 15:00
- **IP6:** 15:00 to 16:00
- **PM1:** 16:00 to 17:00
- **PM2:** 17:00 to 18:00
- **PM3:** 18:00 to 19:00

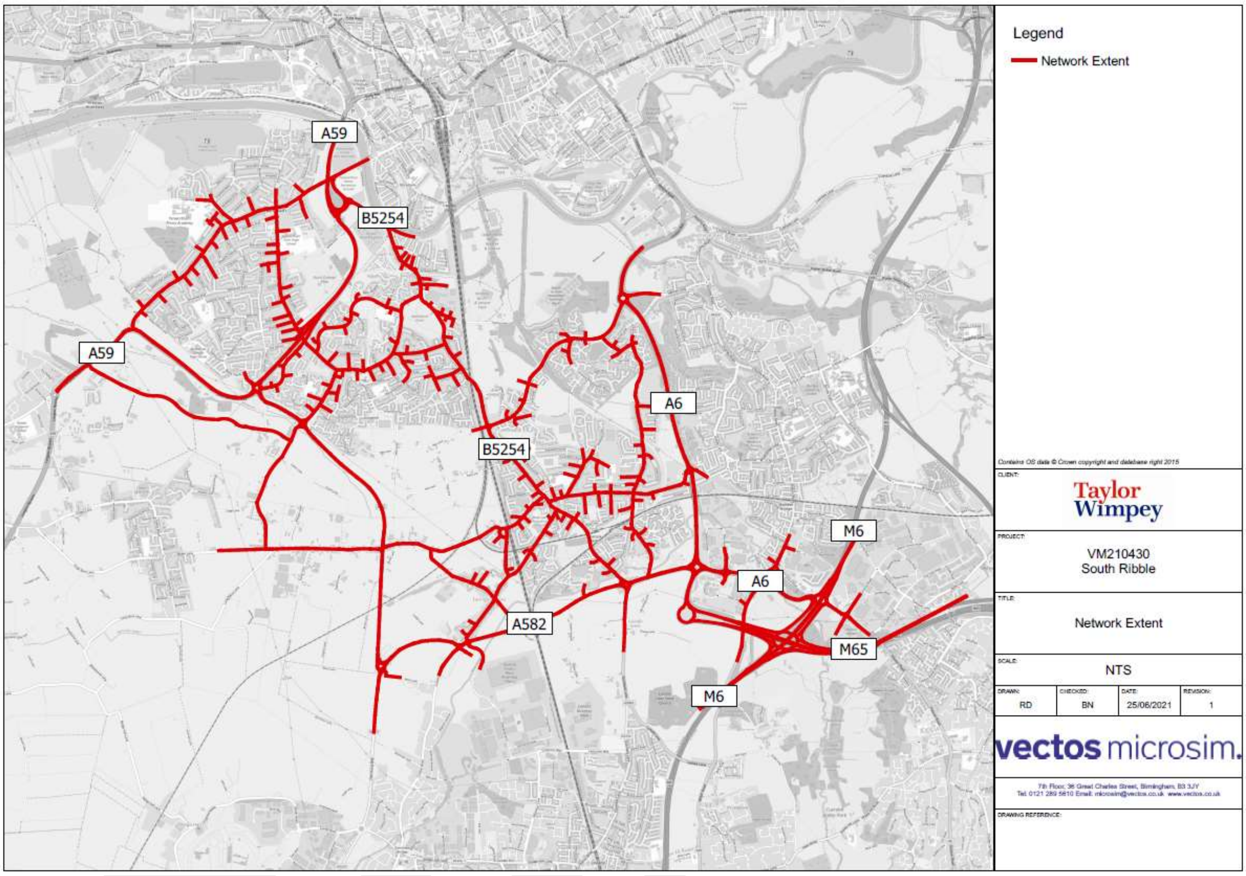
Network extent

3.5 The model was built to include the network highlighted in the following figure. This network was then reviewed and refined to ensure it reflects the necessary level of detail. It was determined that it would be necessary to include the major routes across the study area, along with the east/west routes connecting these. Accordingly, alongside the inclusion of the A582 Penwortham Way, A59 and A6, Coote Lane, Cop Lane and Pope Lane have been included.

3.6 Given the high volumes of traffic on the B5254 Leyland Way this route has also been included.

3.7 Furthermore it was determined that the M65/M6 junction should also be included to enable an assessment of any potential impact on the Strategic Road Network close to the development area.

Figure 4 Model Extent



Generalised Cost Equation

3.8 The Generalised Cost Equation (GCE) assigned to the Paramics model has a direct effect on the way vehicles route through the network. As a result the GCE that is adopted throughout the course of the model development should be defined in advance of Matrix Estimation (the process by which Origin/Destination are refined based on a series of inputs).

3.9 The GCE, for each vehicle type, have been calculated using the guidance outlined in TAG Unit A1.3 and Unit M2, using relevant values contained in the TAG Data Book July 2020 (release V1.4).

3.10 The resultant Time and Distance values by vehicle type are shown in the following table.

Table 1 Time & Distance Values

Type	Description	Time	Distance
1	Car	3.55	1.37
2	LGV	5.10	1.79
3	OGV1	5.25	4.05
4	OGV2	5.25	7.43

Vehicle Types

3.11 Analysis of the composition of vehicles on the network was undertaken through a review of the survey data and the general vehicle split observed at a number of key locations.

3.12 The resultant mix of fleet assigned within the model is summarised within the following table for the AM, Inter-peak and PM periods respectively.

Table 2 Vehicle Type Proportions

Matrix	Vehicle Type	AM			IP						PM		
		0700-0800	0800-0900	0900-1000	1000 - 1100	1100 - 1200	1200 - 1300	1300 - 1400	1400 - 1500	1500 - 1600	1600-1700	1700-1800	1800-1900
1	Car	82%	86%	84%	83%	84%	86%	85%	86%	86%	87%	89%	91%
1	LGV	18%	14%	16%	17%	16%	14%	15%	14%	14%	13%	11%	9%
2	MGV	71%	72%	73%	70%	72%	74%	72%	67%	66%	65%	63%	60%
2	HGV	29%	28%	27%	30%	28%	26%	28%	33%	34%	35%	37%	40%

Familiarity

3.13 The percentage familiarity is used to account for driver's propensity to reassign based on their local knowledge of the network. As a starting point The Good Practice Guide suggests a familiarity between 40% and 60% for light vehicles and less for heavy goods vehicles and coaches as they are unlikely to deviate from the signposted routes.

3.14 The familiarity assigned to each of the vehicle types used within the updated model are presented in the table below. In this instance the familiarity has been set 10% higher than the suggested range for car vehicles. Vectos applied this level as it was necessary to achieve the correct routing levels during the calibration process.

Perturbation

3.15 Perturbation is used to account for variability in driver's perception of travel costs. Perturbation 5% was applied consistently to all light and heavy vehicle types in the model. In line with good modelling practice this is the commonly used perturbation percentage.

Table 3 Familiarity & Perturbation

Matrix	Number	Type	Familiarity (%)	Perturbation (%)
1	1	Car	70	5
2	2	LGV	40	5
3	3	OGV1	20	5
3	4	OGV2	10	5

Link Type

Urban/Highway Links

3.16 Defining a link as Urban or Highway has a significant impact on vehicle behaviour within a model

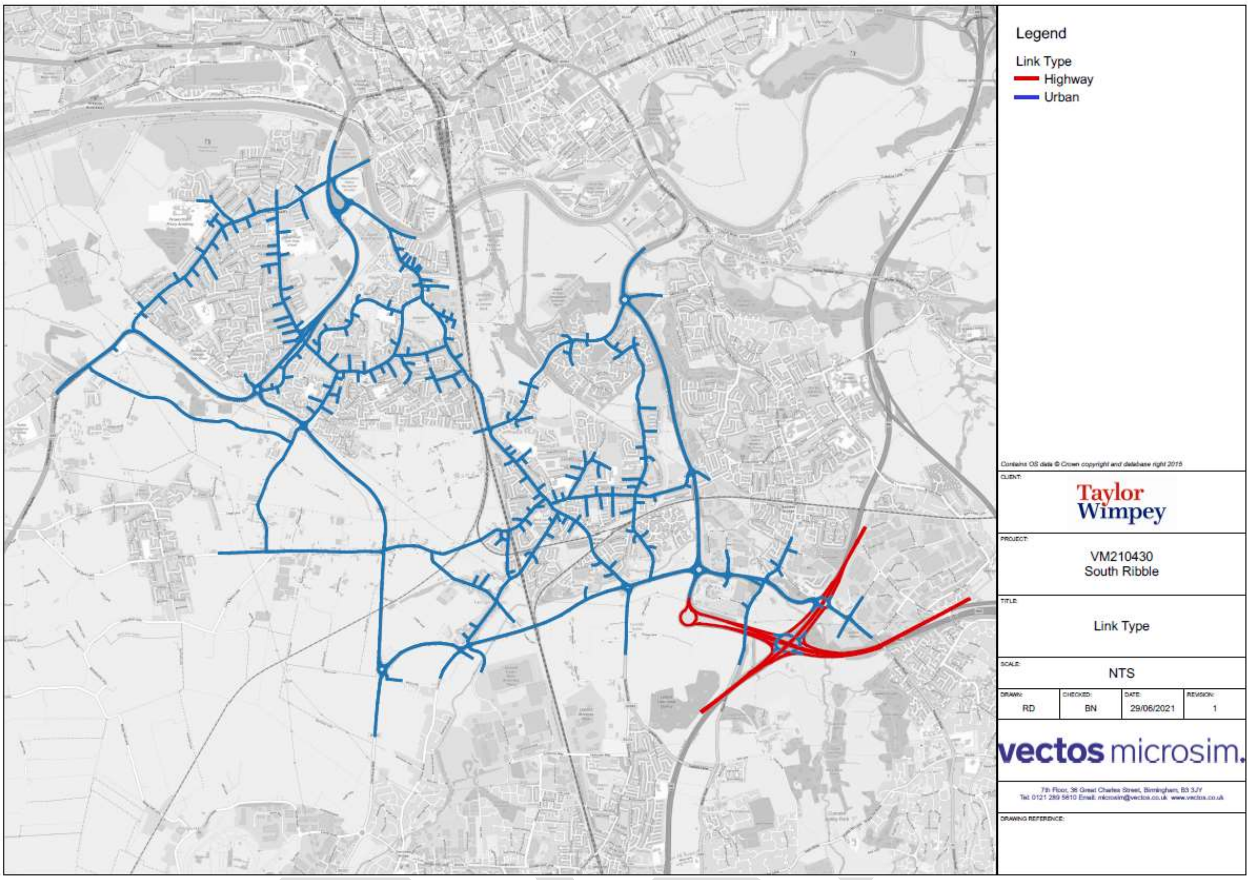
3.17 On Highway links vehicles will demonstrate motorway behaviour, some examples include:

- Using the outside lanes for overtaking
- Merging/ diverging rather than getting into lane immediately
- Greater speed differential (i.e. a larger willingness to exceed the speed limit)
- Lane based speed desegregation (i.e. slower speeds in lane 1 and faster speeds on lanes 2, 3 etc.)

3.18 On Urban links vehicles exhibit urban behaviour such as getting into lane immediately on approach to junctions, giving-way at priority junctions, and a lower speed differential.

3.19 The link types assigned within the model has been demonstrated within **Figure 5.**

Figure 5 Link Type



Link Classification

Major/Minor Links

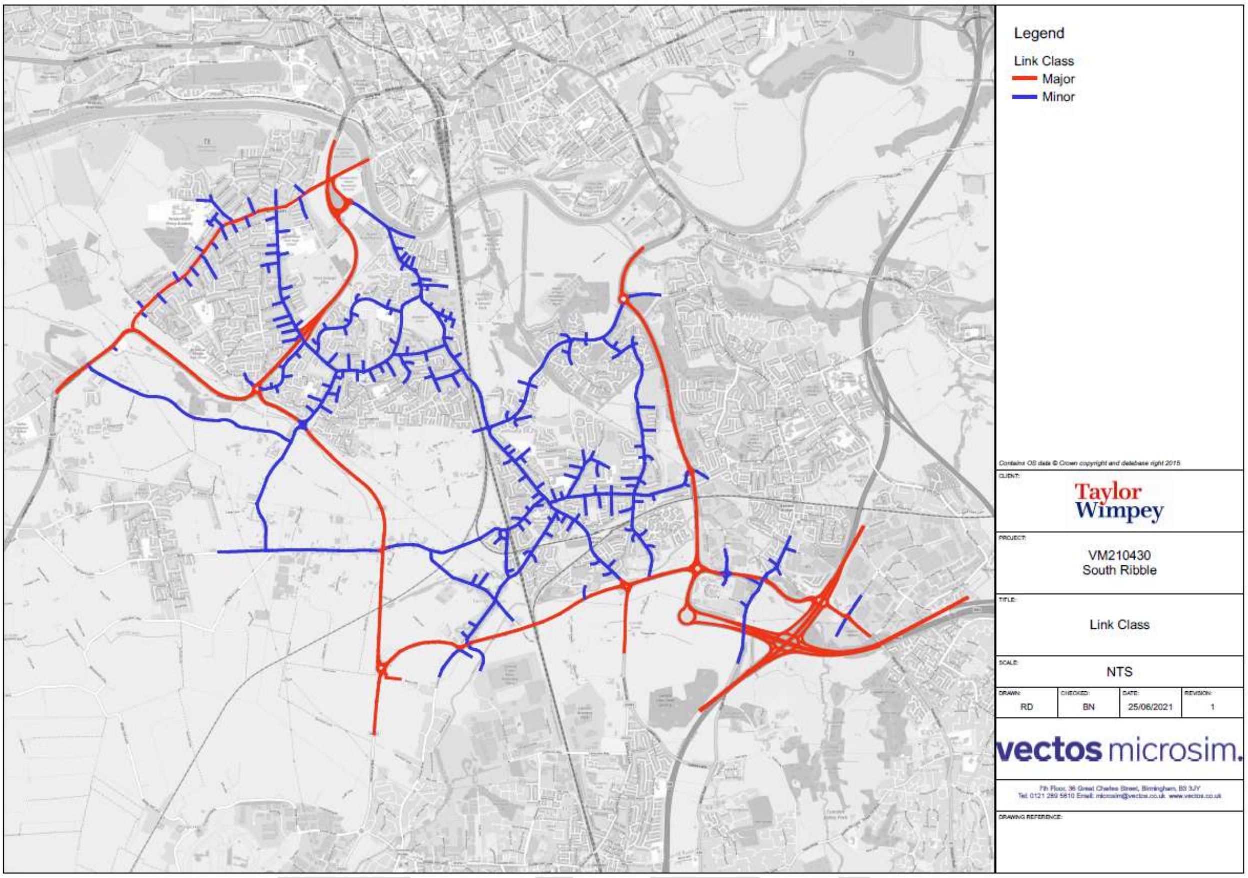
3.20 Road hierarchy is used to alter the cost of travelling on particular links. Whether a link has been classified as Major or Minor will have a direct impact on the perceived cost of using that link and will vary depending upon whether a driver is classed as Familiar or Unfamiliar.

3.21 A Familiar driver is someone who knows the alternative routes from A to B and will comfortably switch between them to save time, whereas an unfamiliar driver is someone who generally follows the main signposted routes unless significant conditions force them otherwise. This behaviour is reflected within the model by how each driver type perceives the cost of the Major and Minor links.

3.22 Major links are assumed to be signposted, so the true cost of travelling along them is known to both Familiar and Unfamiliar drivers, whilst the cost of travelling along minor links is perceived as being twice the true cost for drivers who are Unfamiliar.

3.23 The following **Figure 6** shows how the link types have been applied within the model.

Figure 6 Link Classification



Link Categories

3.24 Individual link categories can be created in Paramics containing basic road attributes such as speed, width, and cost factors. By using link categories attributes can be changed with one edit which will be applied to all roads of that category, where the parameter has not been individually set.

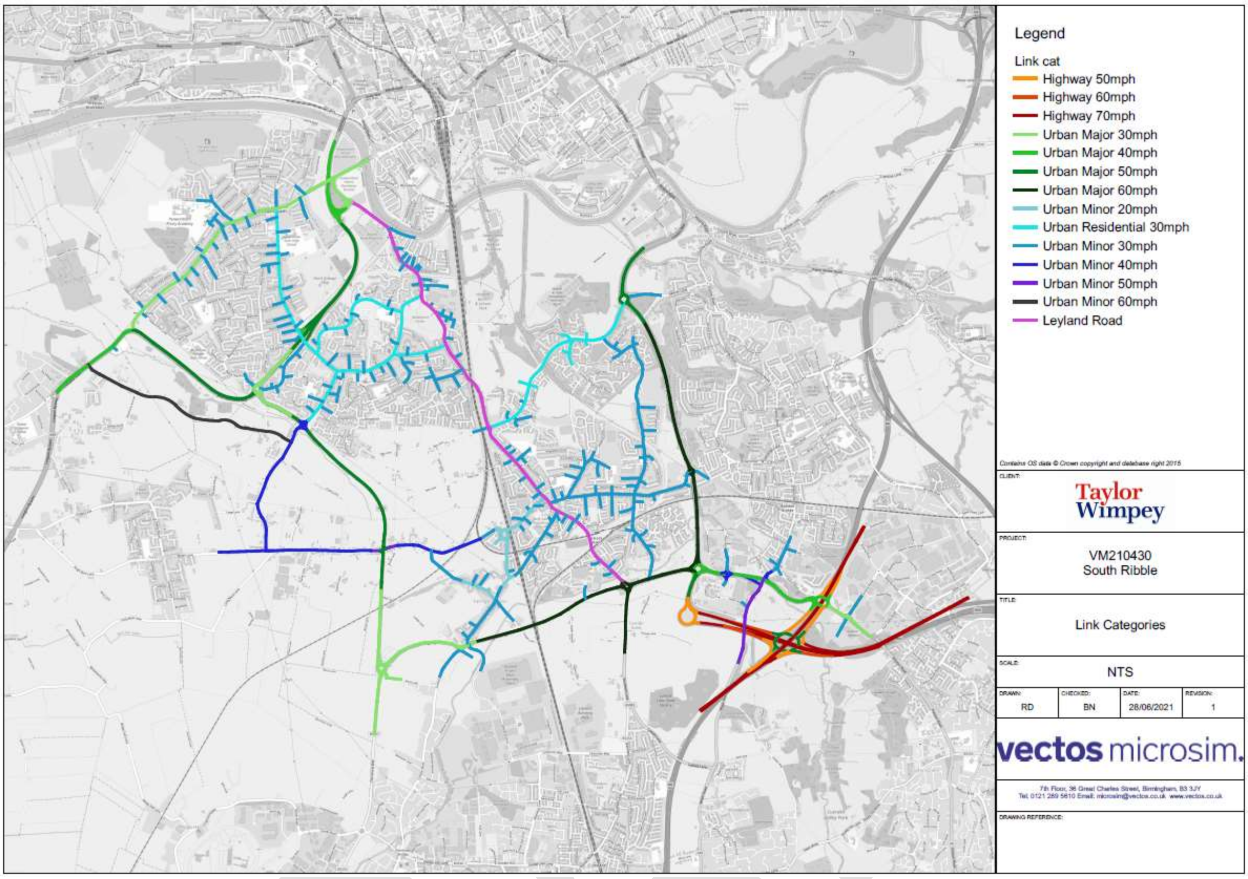
3.25 **Figure 7** shows how the link categories have been adopted within the model.

3.26 The primary role of the categories is to determine key characteristics quickly and apply them during the model development.

3.27 It is worth noting that a specific category for Leyland Road has been created to enable specific link characteristics for this entire route to be edited. Despite the route being urban/residential in nature, it is a well-used route with high traffic volumes.

3.28 Accordingly during the calibration process it was determined that a cost factor of 0.9 for this route achieved the best balance of flows, compared with the alternative north to south movement through the study areas, the A582. This was applied to the 'Leyland Road' category.

Figure 7 Link Categories

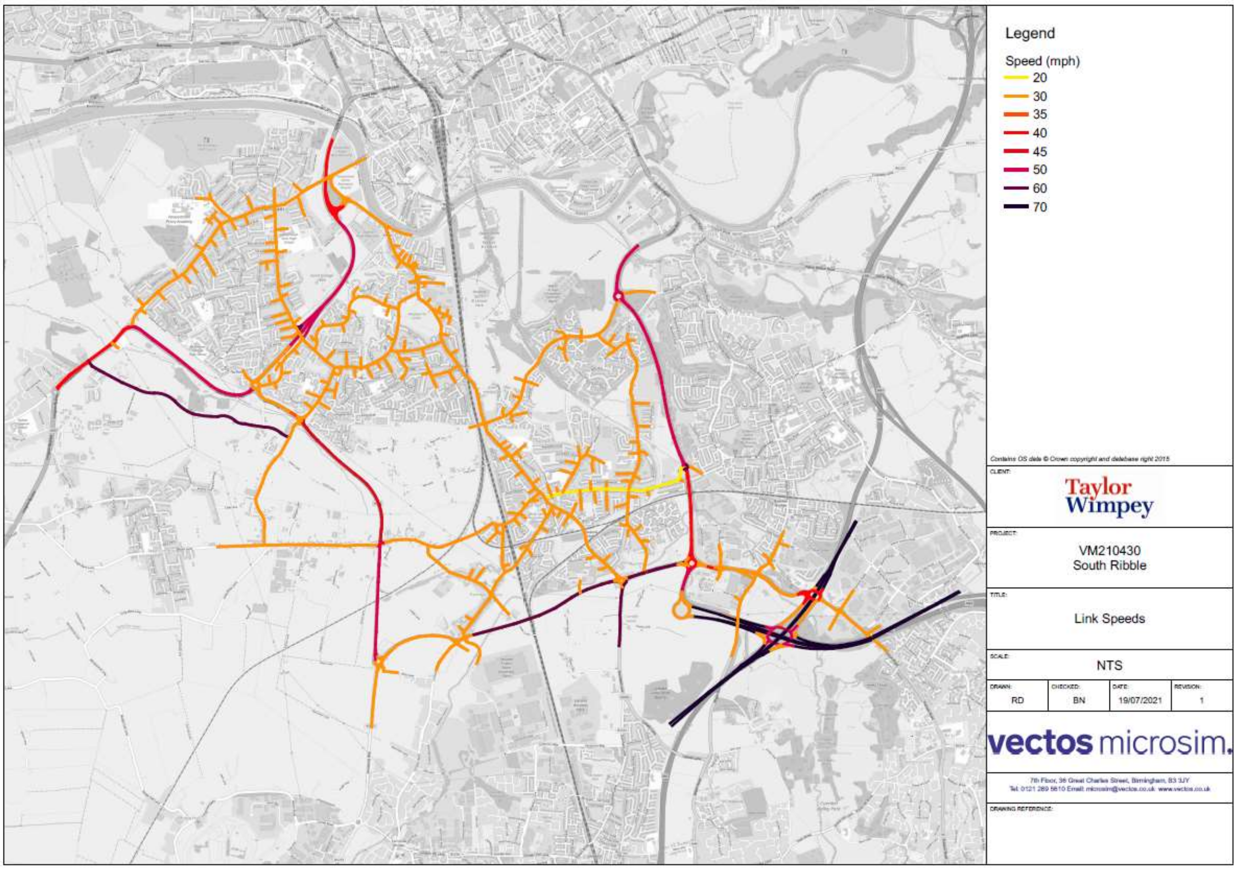


Speed Limits

3.29 A key aspect of the categories described previously is to define the link speeds. These have been coded as per the following figure and reflect the 2021 on street speed limits.

3.30 Streetwise TomTom data supplemented link speed allocation where free flow speed could be identified and applied to the model network.

Figure 8 Network Speed Limits



Public Transport

3.31 Bus stops and bus routes have been explicitly included within the model. A full review of bus routes and timetables/schedules have been undertaken to ensure the model is reflective of the 2021 bus services provided within the modelled area.

3.32 Bus services included within the model have been informed by the Lancashire County Council online resources.

3.33 A total of 40 routes have been defined within the model each of which has been assigned the relevant schedules and or frequency. All bus stops were included with a dwell time of 15 seconds.

Signposting

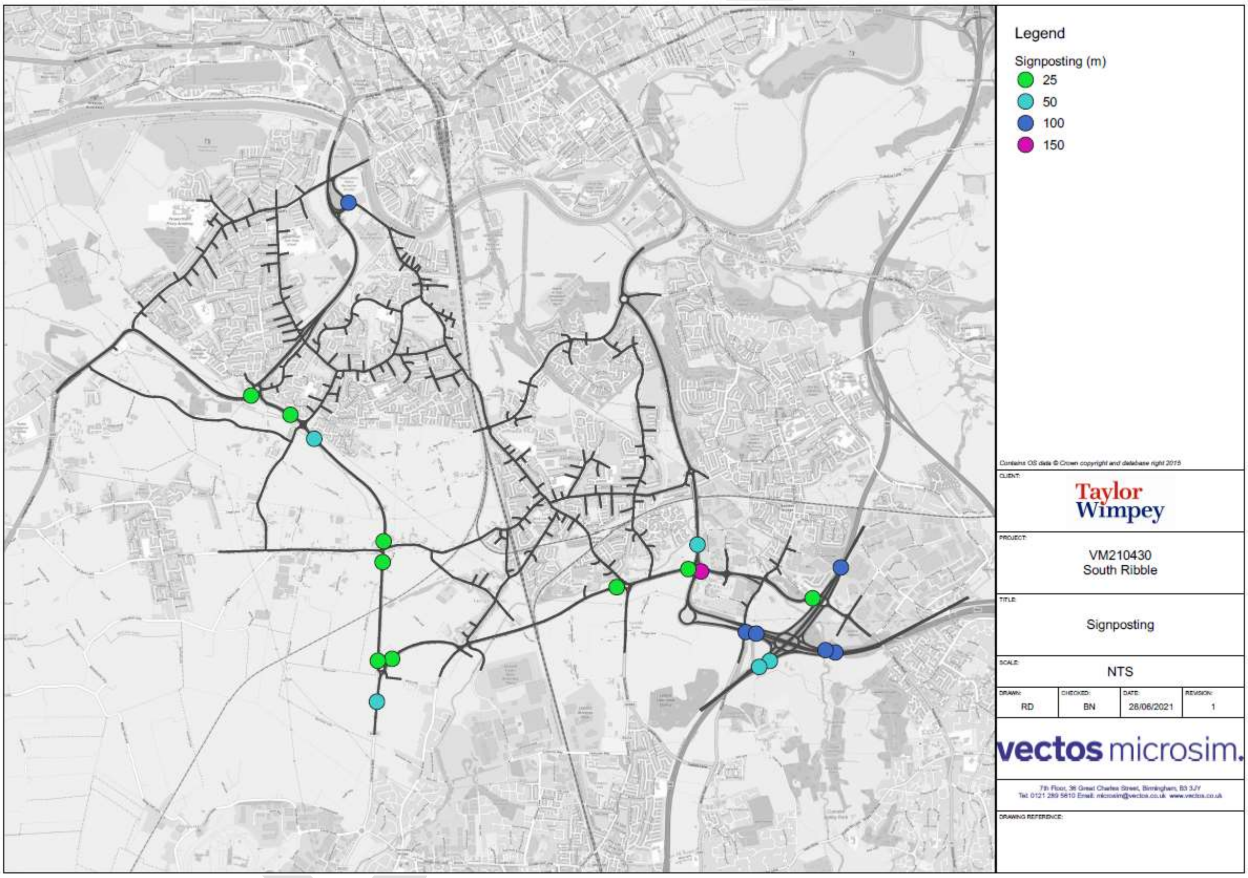
3.34 Signposts are the locations on the network when simulated vehicles first see an upcoming hazard ahead. Hazards are features on the network that may require them to take an action, for example to change lane to make turn at a junction from that lane. They are defined by a distance upstream of (or back from) the node where the hazard occurs. The default signpost distance is 250m on Urban links and 750m on Highway links.

3.35 In certain situations, the default signpost distance may result in vehicles not fully utilising lane capacity. For example, in a situation where two lanes drop to one lane 100m after a signalised junction, if vehicles can see the lane drop on approach to the junction, they will utilise only one lane of the two lanes to queue. This will halve the capacity of the junction approach and reduce throughput. Reducing the signpost distance on the node where the lane drop occurs prevents the vehicles from anticipating the lane drop until they pass the signals and are on the merge section, thereby increasing throughput.

3.36 Similarly, if in reality a queue for a junction occurs only in one lane, it may be required to increase signposting. Vehicles will need to anticipate the junction up ahead to know they should join the back of the queue and not attempt to merge closer to the junction, holding up other traffic.

3.37 The locations where the signposting have been changed from the model defaults are shown in following **Figure 9**. There are a range of adjustments reflecting the desire to reflect lane behaviour as accurately as possible.

Figure 9 Signposting



Zone System

3.38 A zone system was developed in a way that captured concentration of significant land use and isolated pockets of residential areas. This provides a means of controlling the loading strategy for zones and enables sensible constraints strategy to be applied to each zone during the Matrix Estimation process.

3.39 External zones were applied to all major external links within the model.

3.40 A part of this model development, a zone system was configured to enable the numbering of zones to be used to identify the location and predominant type of land use within each zone. The following numbering series was used in the zone development process:

— 0-100 Residential zones

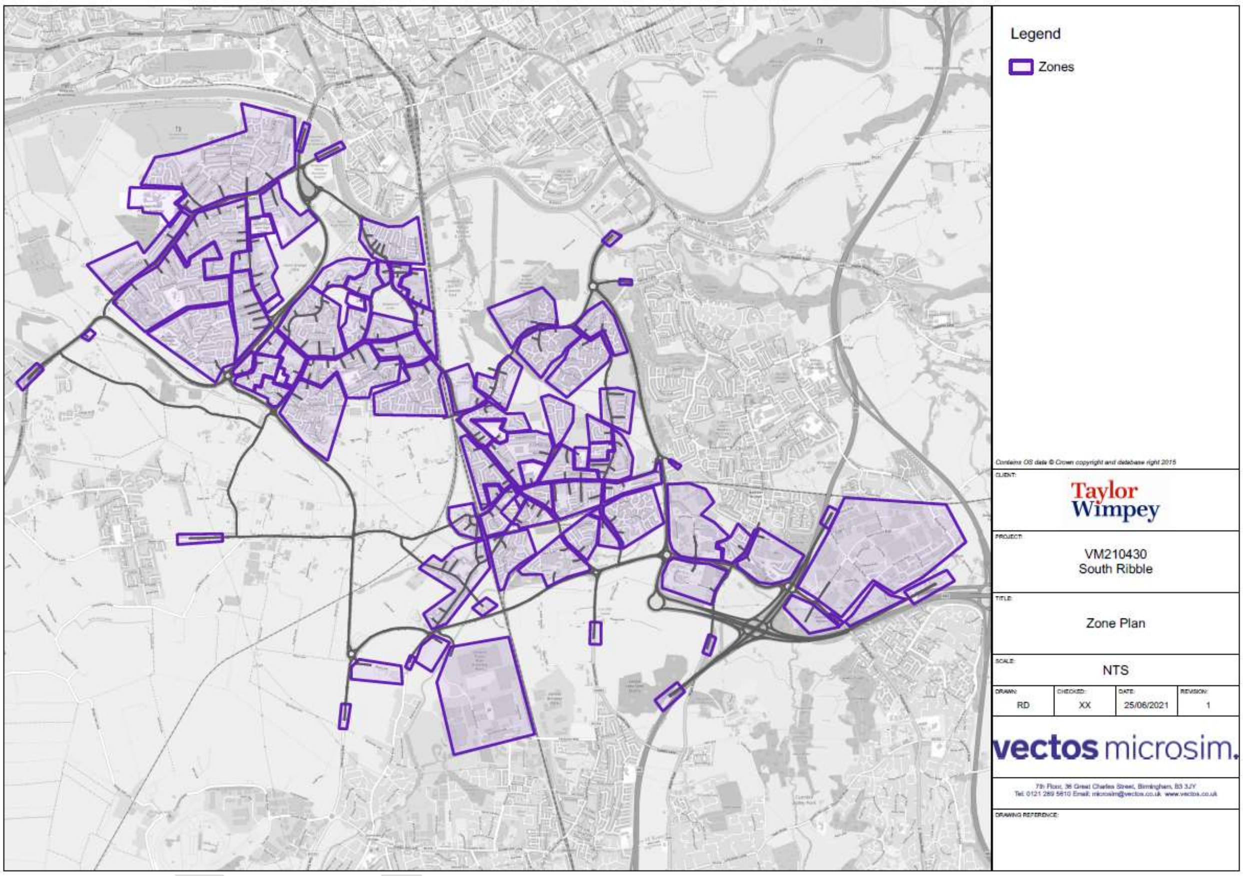
— 200-300 Employment

— 300-400 Education

— 400-500 Retail/Leisure/Mixed

— 900 External

Figure 10 Zone Plan



Zone Portals

3.41 For zones which cover larger areas, zone portals have been used to distribute the total zone trips across various loading points. Zone portal percentage capacity has been used as a means of controlling the loading proportions attributed to each of the portals.

3.42 Large zones within the model have often been assigned more than one zone portal, to represent a number of loading points from the zone. Where this is the case, a proportion of traffic leaving each portal within the zone has been determined, based upon the land use spread and access points for each zone.

4 Matrix Development

Overview

4.1 In common with all other traffic model applications, an Origin Destination (OD) matrix of travel demand through the network is required. This matrix is estimated through the Paramics Matrix Estimation (ME) module. The Paramics ME module requires three key elements for each individual model period in order to assign an OD matrix. These are:

- A Survey File
- A Routing File
- A Prior Matrix

4.2 The Paramics ME combines these elements and produces an estimated matrix for each hourly period under consideration. This is not the final matrix as dynamic assignment and model network calibration parameters are not considered during this stage. The assigned link flows do consider these elements and thus the validation is based on assigned flows rather than matrix estimated flows. The estimated matrix is therefore subject to calibration once it has been assigned to the network.

Survey File

4.3 The survey file is derived from observed count data, recorded from surveys and manipulated through a spreadsheet. This then provides a 'target' against which the Paramics ME module can attempt to balance the matrix.

4.4 Survey files were developed for each specific model period and split by vehicle type. Cars and LGVs were combined into the first survey file whilst OGV1 and OGV2 were combined in the second. Segregating the survey file by vehicle type allows tiered matrices to be estimated using specific count data and routing files for specific vehicle types. In this case a two tier approach was taken to the production of assignment matrices.

- Matrix 1: Controls the estimation of car and lights goods vehicle types
- Matrix 2:Controls the estimation of heavy goods vehicle types

4.5 These initial matrix levels were adopted to control the estimation of the two different vehicle classifications. The development of the initial Prior matrices is summarised later in this chapter.

Routing File

4.6 The routeing file utilised in Matrix Estimation was a Paramics generated Pija file. The use of a Pija file enables the collection of a complete sampling of the route choice within the network

4.7 The Pija file is generated by assessment of 100 routeing tests, assigned to every OD pair. This information is used to generate a set of routes through the network. The routing for each individual OD pair is recorded and assigned within the ME process. For the purposes of the collection of the

PIJA file in this model update, the link and turn filter was applied in the form of the survey file, to ensure that the PIJA file collected did not exceed the maximum size limit.

Prior Matrix Development

4.8 The primary use of the Matrix Estimation module is to reflect the existing demand conditions through refinement of the initial prior matrix. It is important that the prior matrix reflects a good approximation of traffic distributions and volumes expected across the study area. The methodology involved in the construction of the prior matrices used within ME is outlined below.

Lights Prior Matrix (Matrix 1)

4.9 The primary source of data used to inform the development of the Lights prior matrix for zones within the model was 2011 Census data. The methodology to develop the suitable prior matrices from the Census data is described below.

Trip Distribution

4.10 One of the most critical aspects in deriving the Prior matrix involves the determination of the traffic patterns across the study area.

4.11 In this case, Census Journey to Work (JtW) information, has been used as the predominant source of information to inform the distribution of trips across the model.

4.12 Each internal model zone was assigned a local MSOA. The MND trip distributions were then extracted for the MSOAs in the study area to provide an indication of the travel patterns between the different areas.

4.13 The model has been split into the following 8 MSOAs in which each of the ‘internal’ model zones lie

— South Ribble 001

— South Ribble 003

— South Ribble 004

— South Ribble 005

— South Ribble 006

— South Ribble 007

— South Ribble 008

— South Ribble 009

— South Ribble 012

4.14 Using Census Journey to Work outputs, a proxy distribution was created for each MSOA. This created 8 distributions to be assigned to and from all internal zones.

4.15 To enable the prior matrix to be developed further, disaggregation of the residential and employment areas within the model was defined. This enabled an approximation for internal to/from external and internal to internal trips to be made between the model zones and the corresponding MSOA areas they lie within.

4.16 A distribution was therefore derived for each main area for following trip types:

- Internal to External
- External to Internal
- Internal to Internal
- External to External

4.17 The methodology is summarised below.

Internal to External Trips

4.18 The first step involved the identification of the trips for the MSOA traveling out of the model via an External zone. Census data comprises of Journey to work data and therefore within the AM period the trip origins are assumed to be from zones that are classified as residential. Google routing data was then used to determine the most likely routing of trips, from each of the model areas defined above, to the External destination, therefore defining the External zone these trips would have to pass through.

Internal to Internal Trips

4.19 For Internal trips, Census data internal to the MSOA, has been a proportioned out between the main residential areas and are assumed to travel to internal employment zones.

4.20 Each residential area has its own unique, employment weighting based upon the relative size of the employment 'zones' but adjusted, based on proximity to the employment areas, to ensure adjacent residential/employment sites do not generate a large number of vehicle trips to a neighbouring zone. This reflects the likelihood that these trips are made by foot of and cycle.

4.21 The initial employment zone weighting (i.e. the trip attraction weight) was based on count data were available (e.g. relative volumes captured on the employment site's access/egress junction(s)) or from an approximation of the number of car parking spaces converted to a realistic trip generation. A comparison these numbers for each employment site provides a 'ratio' to be applied to the total trips traveling to the MSOA in the AM (i.e. to work trips). In terms of the splitting the outbound trips between the component residential zones within the single MSOA (in the case of the AM workings), this has been based on the relative number of houses within each of the defined internal residential zones.

External to Internal Trips

4.22 External to Internal trips were again informed by the census MSOA data. Trips traveling from outside the model within the AM period are assumed to be residential to employment trips and therefore complete at an internal employment area and in the PM they are likely to be employment to residential trips and complete at a residential zone. Similar to the Internal to External trips, Google routing data was used to determine the most likely routing of trips from the external zones to each of the model areas defined.

<u>External to External Zones</u>

4.23 The distribution between External zones was informed via the weighted matrix, with a different weighting given to each of the external zones, dependent on the category of road into/out of the zone, and the likely destination each external zone represents. This enabled a prediction of the proportion of trips for each External zone to each of the other External zones.

Trip Generation

4.24 Once the trip distributions were calculated a tiered approach to the derivation of trip generation totals (trip-ends) to be assigned to each of the model zones was adopted on the following basis:

4.25 For any zones classified as Residential, the number of dwellings was estimated using address point data, and a proxy trip rate has been calculated based on known residential counts within the area. For each residential zone the trip rates for each modelled hour were applied to the number of dwellings within each zone, to derive appropriate arrival and departure numbers.

4.26 Trip generation associated with the employment zones was derived using GIS to estimate the employment area or an estimation based on the car park size, and applying a proxy employment trip rate based upon land use type. The estimated floor area was multiplied by the employment trip rates to derive an estimate of arrivals and departures for each zone.

Combining the Distributions and Assigning Trip Generation

4.27 The prior matrices demands were calculated by applying the respective trip generation and the associated zone's distribution for the inbound and outbound directions. The two matrices were then combined, taking the average value when both matrices contained a value, or the non-zero value when one matrix suggested zero trips. Application of this methodology resulted in a separate Prior Matrix for each modelled hour.

Constraints

4.28 Constraints are a vital part of almost all Matrix Estimation (ME) processes. Potentially the only exception is if ALL the movements into and out of ALL zones have a count on them. Constraints can be used to:

— Prevent known movements / robust data in the prior matrix from reducing

— Prevent ME from increasing unwanted trips (e.g. short trips between adjacent zones)

— Develop a robust ME process (e.g. by developing constraints based on trip type/ prior matrix sources)

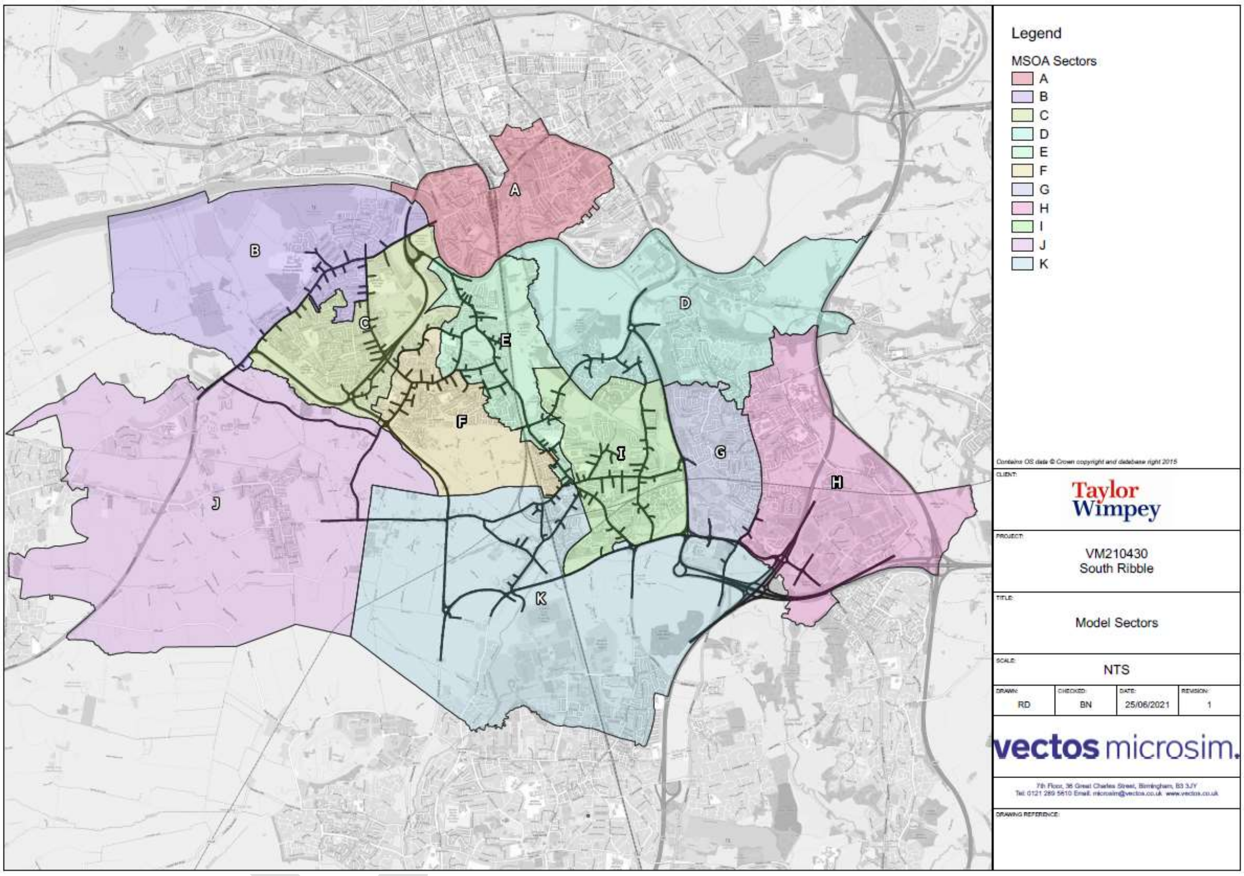
4.29 The application of the constraints was applied whereby the type and level of constraint was informed by the initial value assigned to the O/D movement. Movements to and from external zones were able to alter by a larger amount than the movements between the internal MSOAs.

4.30 OD values were classified as either Small, Medium or Large based on the following criteria:

- Small OD: 10 or less
- Medium OD: between 10 to 100
- Large OD: greater than 100

4.31 For the purposes of this application of constraints, the MSOAs were defined as ‘sectors’. A total of 8 internal sectors were defined, the structure of which is illustrated within the following figure, and is based upon the MSOA areas that make up the model extent.

Figure 11 Model Sectors



4.32 Constraints were then applied on a sector to sector basis. OD’s between adjacent sectors were more tightly constrained than those ODs making the same movements between sectors that were larger distances apart.

4.33 For example, movements from Sector B to Sector C (adjacent sectors) were constrained by a smaller number than movements between Sector B and Sector H (which are at opposite ends of the model extent).

4.34 External zones were retained outside of the sectoring process with ‘External’ being assigned as a single region. Movements to and from external zones were able to alter by a larger amount than the movements between the internal sectors.

4.35 The purpose of the constraints is also to prevent 'trip dumping' whereby the ME process assigns a lot of trips to short O/D pairs to balance adjacent counts. Thus, constraints have been applied to cap traffic volumes at a 'maximum' level. If the ME process lowers the volume of certain ODs in order that a balance with the observed data is achieved, this is allowed within the ME process.

4.36 The type of constraint applied was an absolute change (ABS) rather than a percentage change, subject to the initial OD value and the movement being considered.

4.37 An overview of the constraints that were adopted during the Matrix Estimation process is provided within the following table. This demonstrates the constraints applied to small OD values. These values were then multiplied by 3 for internal and 4 for external movements for medium OD values, and subsequently these medium OD values multiplied by 3 for large OD values (for internal and external movements).

Table 4 Matrix Estimation Constraints

	B	C	D	E	F	G	H	I	K	EXT
B	5	5	10	10	10	20	20	20	20	50
C	5	5	10	5	5	20	20	20	20	50
D	10	10	5	10	10	5	5	5	10	50
E	10	5	10	5	5	10	20	5	10	50
F	10	5	10	5	5	10	10	5	5	50
G	20	20	5	10	10	5	5	5	5	50
H	20	20	5	20	10	5	5	5	5	50
I	20	20	5	5	5	5	5	5	5	50
K	20	20	10	10	5	5	5	5	5	50
EXT	50	50	50	50	50	50	50	50	50	50

Table 5 Matrix Estimation Maximum Increase Constraints

Zone Movement	Small <10	Medium 10-100	Large > 100
EXT to EXT	Unconstrained	Unconstrained	Unconstrained
EXT to INT_RESI	100%	200%	300%
EXT to INT_EMP	100%	200%	300%
INT_RESI to EXT	75%	50%	50%
INT_RESI to INT_RESI	75%	50%	50%

INT_RESI to INT_EMP	75%	50%	50%
INT_EMP to EXT	75%	50%	50%
INT_EMP to INT_RESI	75%	50%	50%
INT_EMP to INT_EMP	75%	50%	50%

4.38 The sectoring process has also allowed for greater control over the level of variation that is accepted during the matrix estimation process, for example, sectoring may allow the identification of a shortfall or surplus in demands between regions within the model to be mitigated via a combination of constraints and adjustments on a sector to sector basis whilst the rest of the matrix remains unchanged.

HGV Prior Matrix

4.39 The method by which the prior matrix for matrix level 2 (HGVs) was derived, was through the development of a weighted prior matrix. In order to ensure that assignment of HGVs to residential zones was avoided the following method was adopted:

4.40 Zones which were either residential, education or rural in nature, which did not allow HGVs to enter, were initially assigned a 0. An initial prior was then derived by assigning the following value to each remaining zone type:

— Internal HGV: 1

— External Low HGV: 10

— External High HGV: 50

4.41 Adopting this method ensured that overall, HGV trips were assigned to OD pairs with high totals as well as ensuring that HGV trips were not assigned to unsuitable zones. This matrix was iterated through the Matrix Estimation process using ‘HGV only’ survey data.

Matrix Estimation

4.42 Upon the development of the Survey, Routing, Prior Matrix and Constraints files, the Paramics ME module was used to estimate two tier matrices for each individual modelled hour. Matrix estimation is an iterative process in which the estimated matrix is assigned to the model for checking. Corrections are made within the prior matrix and the process is rerun. During the actual estimation process itself Paramics carries out internal run iterations which calculate and revise the output demand matrix at each step, in an attempt to match the observed values from the survey file. The routing file input to this process was collected once and used throughout the matrix estimation process.

4.43 In an effort to ensure that the ME module does not output an estimated matrix which is far removed from the original prior matrix the number of iterations undertaken during ME was restricted to 15. The target was set in such a way that 95% of the estimated values which, when compared to the observed, return a GEH value of 5 or less for Matrix level 1 (i.e. cars and lights) and 85% for Matrix level 2 (i.e. HGVs). This criterion was achieved for both matrices associated with each model period.

Trip Length Distribution Checks

4.44 As part of the ME process, it is important to check that the trip length distribution patterns observed within the matrices are sensible. Since it is primarily a function of the extent of model and trip patterns, there is no specific criteria to define what a 'sensible' trip length distribution pattern is, rather the checks are intended to establish that there are no anomalous changes such as when the distances are skewed as a result of trip dumping between areas of the model which contain less O/D information in the first case.

4.45 The current differences in trip length have been presented in the following figures for the AM peak, and PM peak, respectively.

Figure 12 AM Peak Trip Length Distribution Changes (Post vs Pre ME)

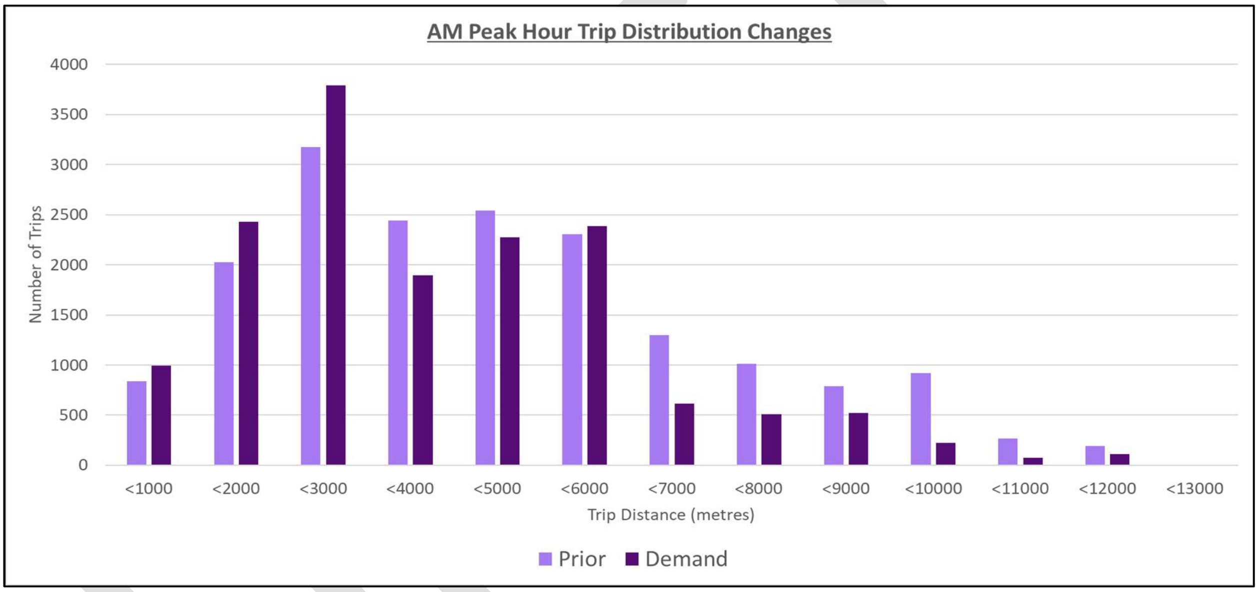
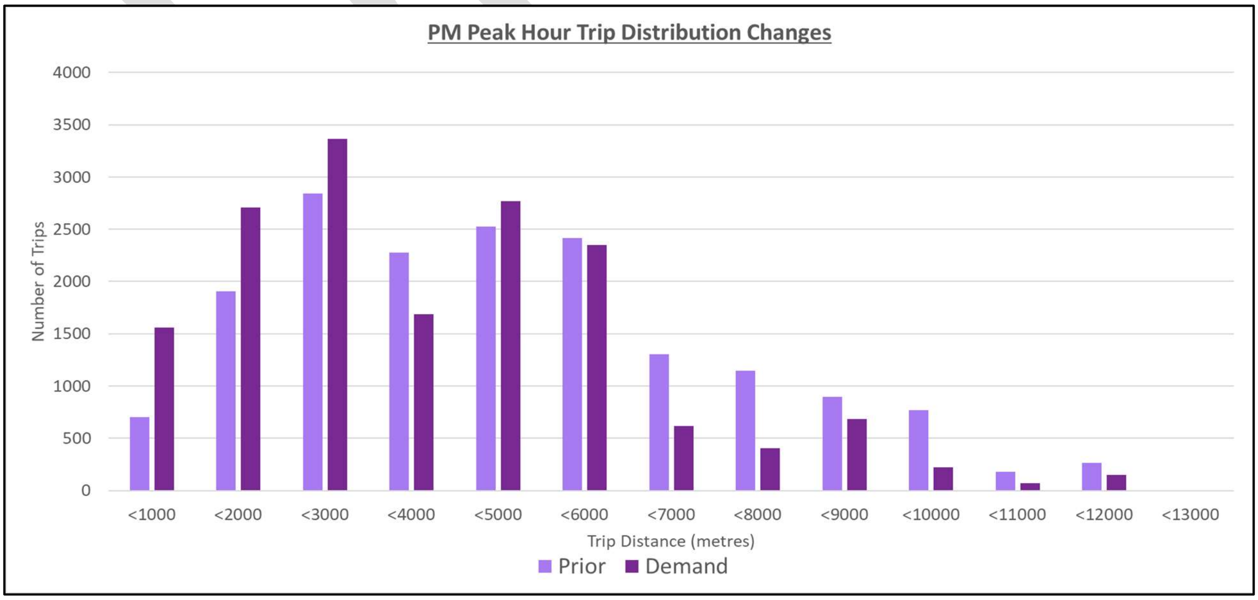


Figure 13 PM Peak Trip Length Distribution Changes (Post vs Pre ME)



4.46 Analysis of the trip length distribution pattern within the model revels the lengths are broadly similar between the pre and post estimated matrices.

Model Demands

4.47 The trip totals by matrix level, post ME, and therefore assigned within the model, are provided within the following table.

Table 6 Assigned Demand Totals

	AM			IP						PM		
	0700-0800	0800-0900	0900-1000	1000 - 1100	1100 - 1200	1200 - 1300	1300 - 1400	1400 - 1500	1500 - 1600	1600-1700	1700-1800	1800-1900
Lights	18996	21593	15716	13698	14887	16298	16273	17868	20284	23601	22752	15305
Heavies	1761	1841	1673	2117	2269	2053	2163	2232	2172	1597	1667	1543
Total	**20757**	**23434**	**17389**	**15815**	**17156**	**18351**	**18436**	**20100**	**22456**	**25198**	**24419**	**16848**

5 Network Calibration

General

5.1 Model calibration is defined as the process by which individual components of a simulation are adjusted to ensure model performance provides an accurate representation of the observed traffic data used in model development. The model calibration has been undertaken in line with current guidelines and the targets used to assess the model validity align with those presented within the DfT web-based Transport Analysis Guidance (WebTAG) and, in particular, unit M3.1[1].

5.2 The geometrical data included in the model has been obtained from site surveys and the use of an Ordnance Survey (OS) data overlay, against which the model network has been coded. Ariel photographs were also used as a reference to ensure the correct layout of junctions as well as to confirm stop line placement.

5.3 The base model network has been calibrated for the AM (07:00 to 10:00), IP (10:00 to 16:00) and PM (16:00 to 19:00) time periods.

Key Microsimulation Parameters

5.4 The key global driver behaviour parameters used in the model calibration are included in following table. Default driving parameters are included for all three modelled periods. To avoid modelling bias, the settings for these parameters should remain constant for the existing and proposed models.

Table 7 Key Global Microsimulation Parameters

Parameters	Values/ Selection
Mean Headway (sec)	1 second (Default)
Minimum Gap	2 metres (Default)
Driver Behaviour (Aggressiveness/Awareness)	Default
Link Categories	Default
Vehicle Speeds	Maximum desired speed set at speed limts
Run per Model	10 random model runs

[1] Highway Assignment Modelling, January 2014

Network Calibration

5.5 Calibration parameters have also been applied to specific sections of the network to allow a better representation of the individual junctions, aside from the repositioning of the stop lines, the main calibration parameters applied within the model, by junction or section, include Headway, Visibility, Look Through, Clear Exit Adherence and Gap Acceptance parameters in the form of Path Merge, Path Cross and Lane Cross.

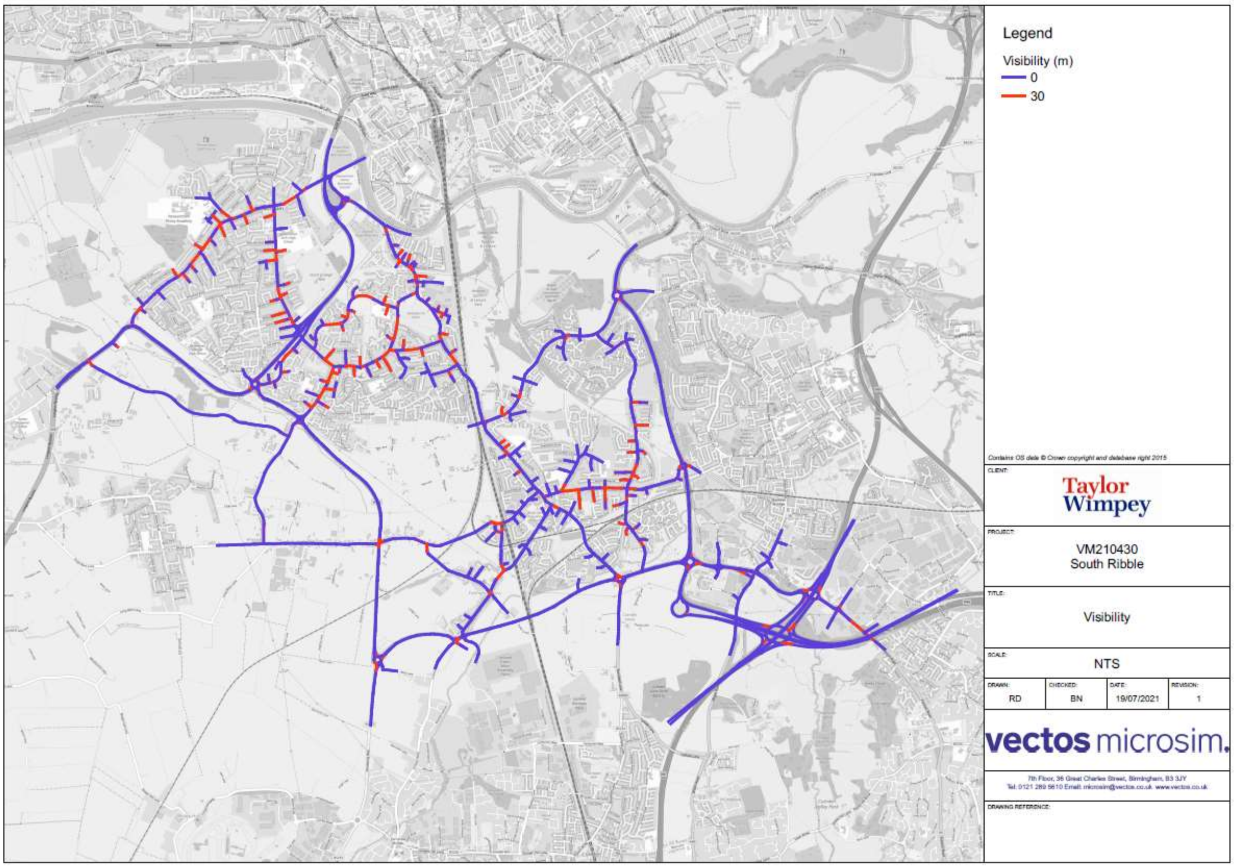
5.6 The following calibration parameters are set to be consistent over all modelled hours. The applied parameters were ensured to calibrate the model across all hours and therefore, no temporal variation was allocated.

Visibility

5.7 Default visibility within Paramics is set to 0m. Any increase on this will increase the distance from which the vehicles will begin to check whether or not their entry into a junction is unopposed. Application of visibility within Paramics is a standard mechanism through which the throughput of individual junction entry arms can be influenced.

5.8 A default visibility of 30m has been set at any approaches to junctions within the model, to reflect on street vehicle behaviour at the junction. The locations where a visibility parameter has been set is illustrated in the following figure.

Figure 14 Link Visibility

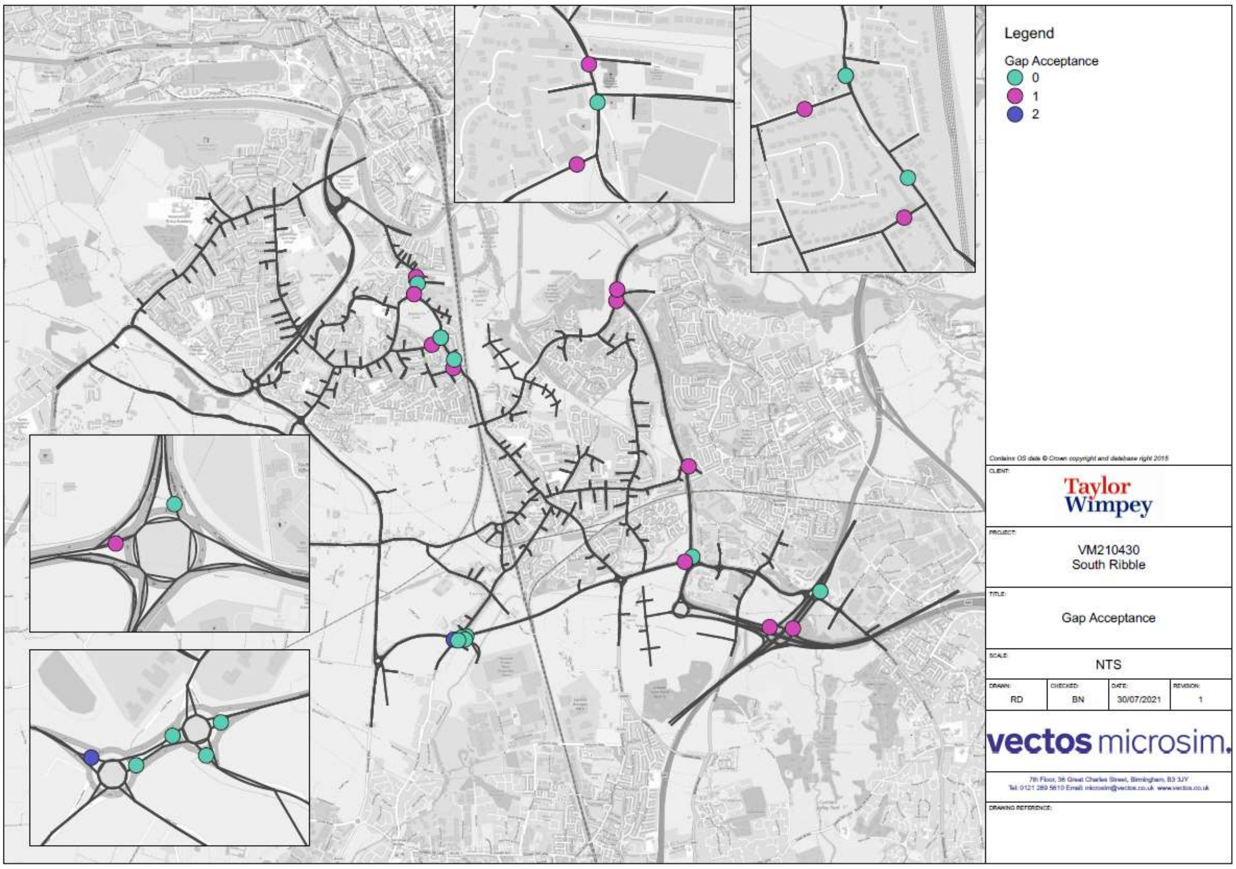


Gap Acceptance

5.9 A reduction in gap acceptance from default of 4 (and 3 for Path Cross) reduces the gap which vehicles deem acceptable between themselves and oncoming vehicles when entering into a junction. The variables which are controlled by the link modifiers tab are essentially ‘buffer’ values as this time is added to the time it takes a vehicles tail to clear the collision point to give the true cap acceptance value.

5.10 Locations at which the gap acceptance has altered from default are highlighted in the following figure.

Figure 15 Gap Acceptance



5.11 **Figure 15** illustrates that gap acceptance values ranging between 0 and 2 that have been applied at specific locations across the network. These changes to the default settings have been applied to ensure movements within the model are representative of observed vehicle behaviours. As noted previously, application of a 0 value does not result in a 0 second gap but draws on the model defaults of 3 and 4 seconds with no additional buffer.

5.12 Gap acceptance has most notably been reduced along the B5254 Leyland Road. This is in response to the slow moving traffic conditions and high levels of courtesy let-in or increased driver aggression to join the B5254 from side roads observed on this part of the network, which the reduced Gap Acceptance parameters reflects more accurately.

5.13 Additionally, a Gap Acceptance value of 1 has been applied on the eastbound and southbound approaches at the M6/M65 roundabout, along with specific approaches to roundabouts on the A6.

This has been applied to ensure that excess queuing does not build up at this junction, in line with observations of the network performance in this area.

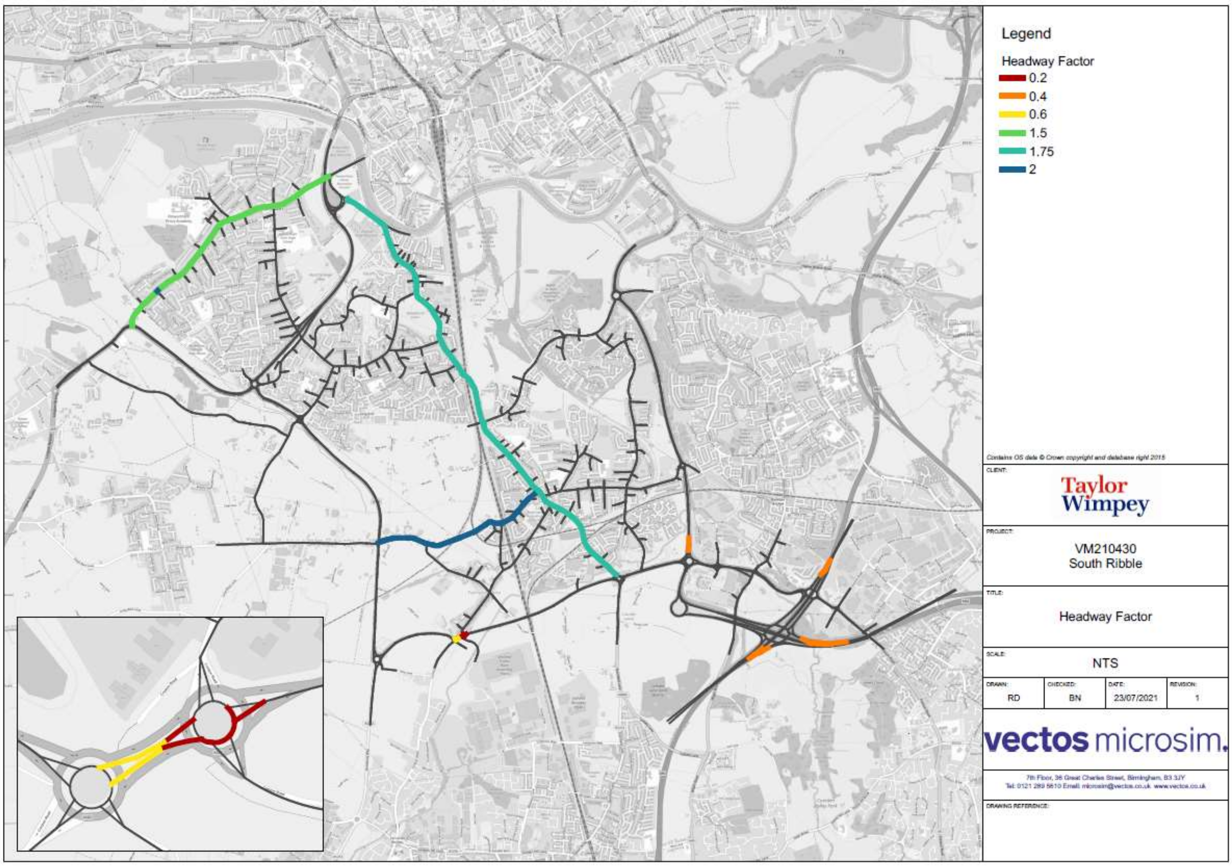
Headway

5.14 Application of a Headway Factor can be used for various reasons within the model. The primary reason for the application of headway within this model has been to reduce the need for vehicles to perform emergency braking procedures to maintain their headways when joining a highway via an on ramp. Accordingly a Headway Factor of 0.4 has been applied to all links where merging onto a motorway or dual carriageway occurs.

5.15 Headway Factors can also be applied in situations whereby the gap between vehicles tends to be larger than the default distance of 2 metres. This is particularly applicable on routes which are urban/residential in nature, contain a high level of traffic calming measures or a number of signal junctions.

5.16 The following **Figure 16** highlights the links where the Headway Factor has been amended.

Figure 16 Headway



5.17 As shown in **Figure 16**, a Headway Factor of 1.5 has been applied along A59, northwest of the model network. This section of the network that accesses Central Preston is known to experience queueing on a regular basis alongside a number of interactions with side roads and large speed differentials meaning that vehicles are inclined to leave slightly larger gaps within this area.

5.18 Similarly, the B5254 is understood to be relatively busy being a key access between Lower Penwortham and Lostcok Hall. A Headway Factor of 1.75 has been applied along the B5254 to reflect the on street vehicle behaviour.

5.19 Finally, a Headway Factor of 2 has been applied on Coote Lane which intersects the B5254. This is intended to reflect the narrow nature of this route, which also contains traffic calming and give way to oncoming traffic network features.

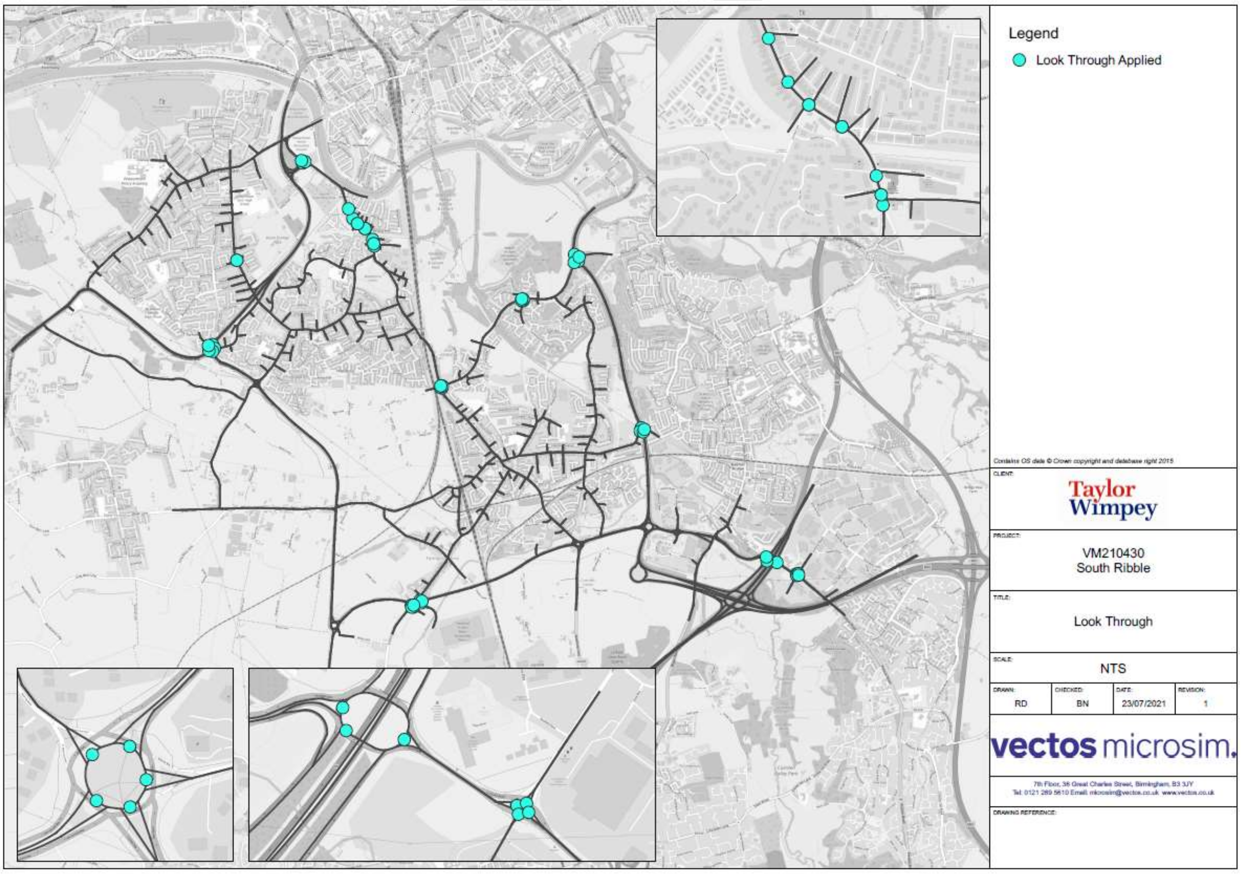
Look Through

5.20 The Look Through modifier allows vehicles to look beyond the end of the link when assessing gap in an opposing stream.

5.21 Look Through has been applied at a number of locations in the model. The common locations where this has been applied occurs on splitter island links on roundabouts and adjacent links of less than 25 metres in length at priority junctions.

5.22 The following figure details the location where the look through modifier has been applied within the model. Note the Look Through parameter has not been applied to the splitter island links at roundabouts which are signalised.

Figure 17 Look Through

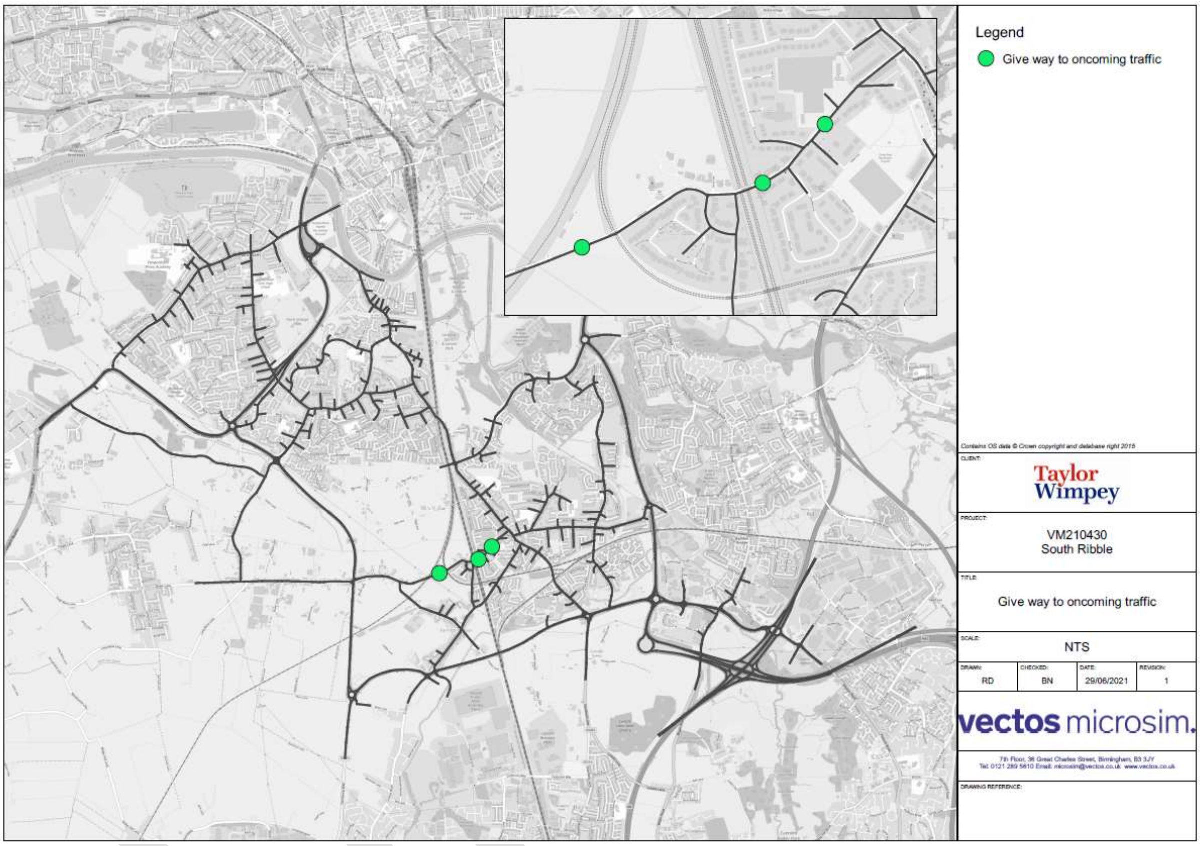


Give Way to Oncoming Traffic

5.23 The application of Give Way to Oncoming Traffic enforces areas where there is directional priorities along a road, often due to the narrow nature of the road, or implemented as traffic calming measures.

5.24 The areas in which the Give Way to Oncoming Traffic parameter has been applied is illustrated in the following **Figure 18**.

Figure 18 Give way to oncoming traffic



5.25 Give Way to Oncoming Traffic has been applied along Coote Lane to reflect the narrowing and give way feature where the road crosses the railway bridge.

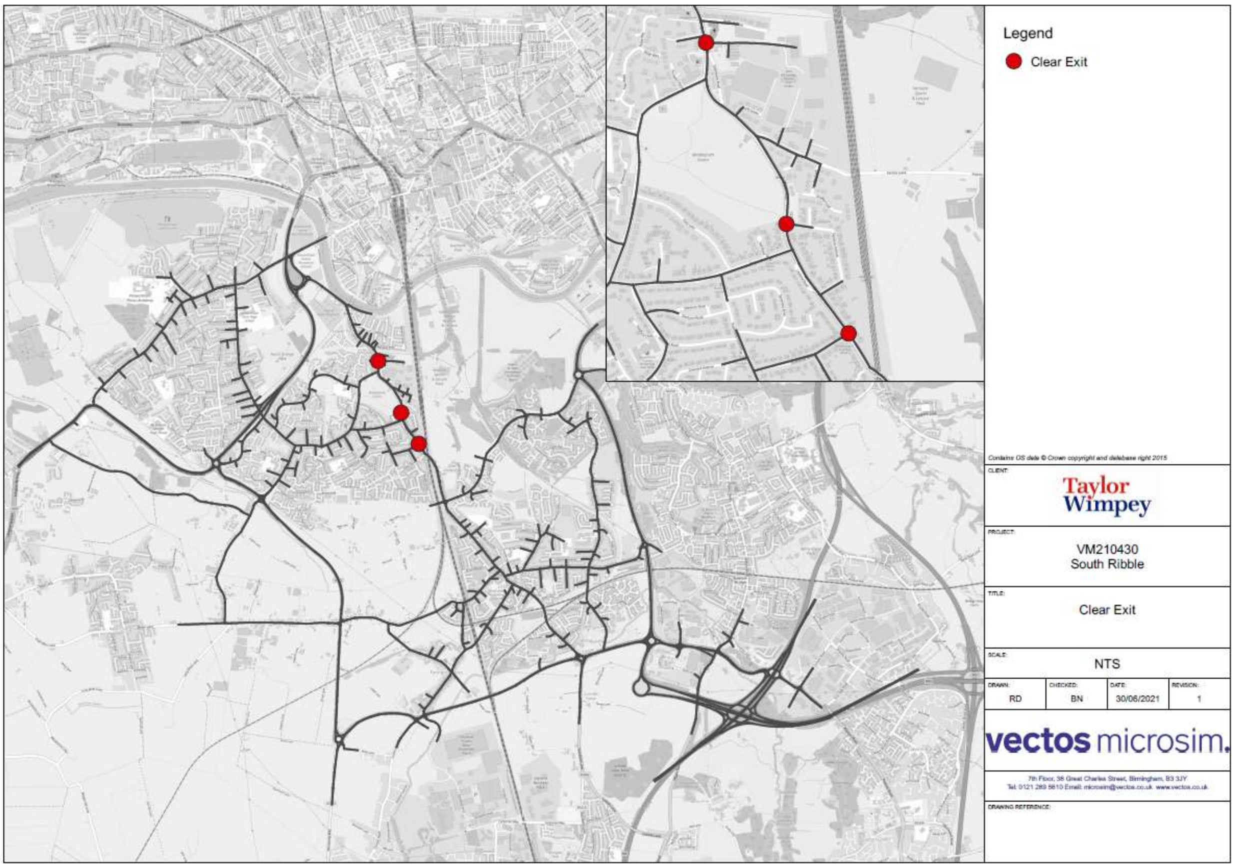
5.26 In addition to this the parameter has been applied at two locations further east on Coote Lane to reflect the large amount of on-street parking prevalent on this part of the network.

Clear Exit Adherence

5.27 Clear Exit Adherence can be applied to specific movements within Paramics to represent driver behaviour where 'courtesy let in' occurs, for turning vehicles when opposing flow is in a slow moving or queued state.

5.28 Courtesy let in has been observed to occur at junctions along the B5254 Leyland Road, where traffic from the side arms is waiting to join the B5254. Accordingly the parameter has been applied to a number of movements along this route, to better replicate on-street conditions, as shown in **Figure 19.**

Figure 19 Clear Exit Adherence Locations



Cost Factors

5.29 Cost factors are an additional calibration tool which can be adopted to influence the route choice. The Good Practice Guide[2] recommends the use of cost factors as being valid in the following instances:

- To reflect signposting and a level of road hierarchy beyond that afforded by the Major/Minor link definition.
- To account for site specific factors that may make a route less attractive to drivers, e.g. on-street parking, narrow roads, etc.

5.30 In this instance an alternate cost factors has been applied throughout the model in two circumstances, which are discussed below.

[2] SIAS, Microsimulation Consultancy Good Practice Guide, 2005, Section 7-10

5.31 A cost factor of 0.8 has been applied along A582, between the Tank Roundabout (Penwortham Way/Flensburg Way) and the A59/John Horrocks Way. This was applied to encourage vehicles travelling from north to south and vice versa in this part of the network to make use of the major route (A582) which would be prioritised by unfamiliar drivers. During calibration it was apparent that the attractiveness of the route was not being fully represented and therefore the cost factor adjustment was applied to achieve the correct routing.

5.32 A cost factor of 1.2 has been applied along residential or more minor routes, to discourage rat-running of vehicles through this part of the model network. The application of cost factors has been guided through a review of the count data and associated model calibration, to ensure that the balance of flows across routes within the model was reflective of observed conditions.

5.33 Accordingly, a cost factor of 1.2 has been applied to the following routes:

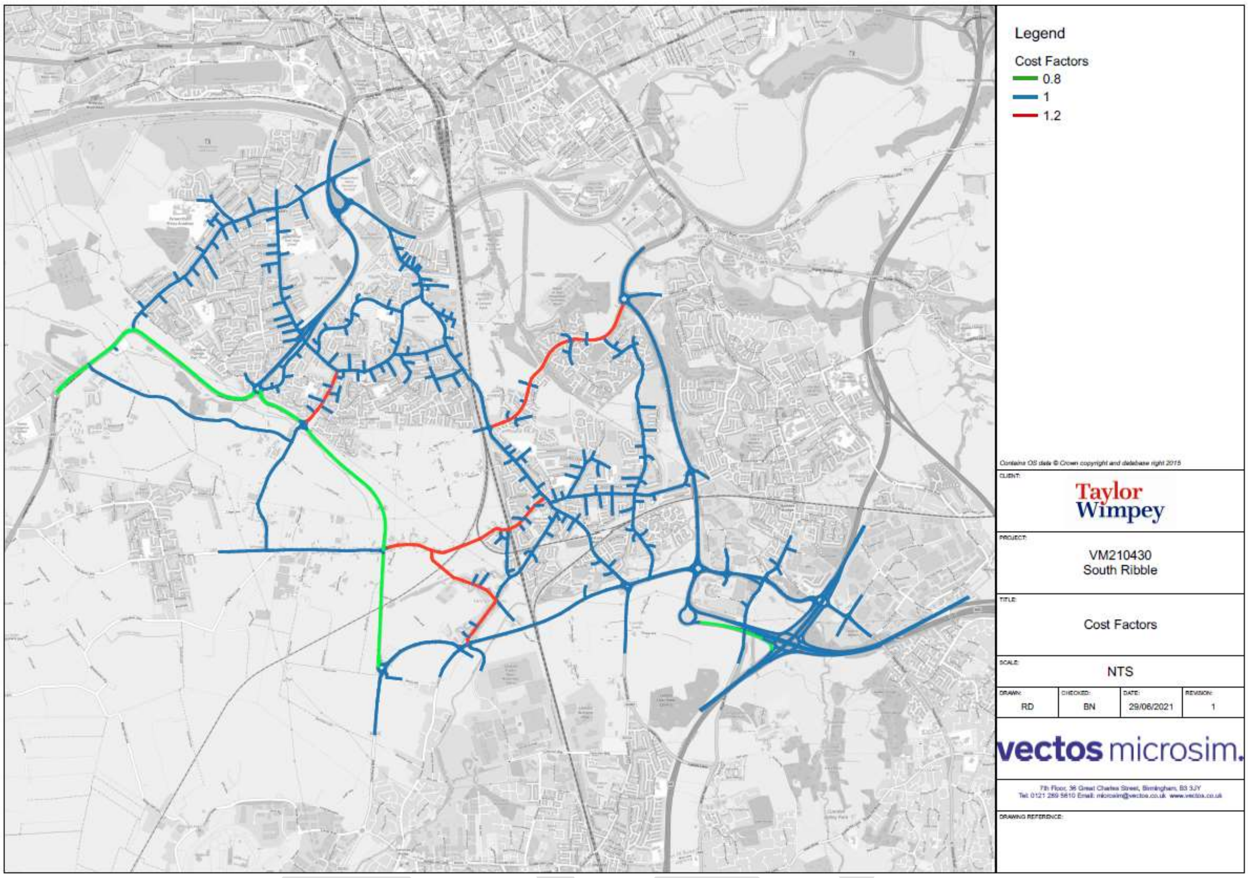
— The Cawsey – to discourage traffic from rat running along this route to join the A6 when travelling north to south/south to north through the network, instead of using the B5254 Leyland Road

— Pope Lane (between the A582 and Cop Lane) – to discourage the rat running of north to south/south to north traffic through the network from using this route and instead of the A582

— Chain House Lane/Coote Lane/Church Lane/Croston Road – to discourage vehicles from rat-running on these routes rather than using the major A582

5.34 The following figure details the locations where link cost factors have been applied within the model.

Figure 20 Cost Factors



Vehicle Release Profiles

5.35 Wherever possible the profiles within the model have been derived directly from count data. This approach is, however, reliant upon data sites being in close proximity to the zones and that that data has been disaggregated into, at least, 15 minute intervals.

5.36 In certain cases, for the reasons outlined above, it is not always possible to derive specific profiles for zones. When this situation occurs it is necessary to derive more general profiles to control the release of vehicles into the model network.

5.37 For the Internal zones, a generic profile has been produced based on count data within each MSOA. As the MSOA boundaries have been used to inform the Sectors, a profile has been developed for each Sector, and applied to the zones that fall within each Sector.

6 Flow Calibration

6.1 The following chapter provides an overview of the observed model flow calibration levels assessed against the criteria set out within WebTAG, specifically Unit M3.1 Table 2.

The GEH Statistics

6.2 The observed flows were checked against the modelled flows on the network and the level of convergence between flows has been calculated. The initial assessment measure is the GEH statistic, which is a common comparative measure in this context. The formula of the GEH statistic is as follows:

$$GEH = \sqrt{\frac{(O-E)^2}{0.5(O+E)}}$$

Where

O = Observed flow

E = Modelled assigned flow

6.3 The GEH is a measure that includes both the absolute and the relative difference. The convergence is considered acceptable if the GEH statistic is less than 5 in 85% of data.

6.4 Calibration and validation results are based on an average of ten random seed runs per time period. A full summary of the comparisons of the Modelled and Observed turn and link count data is available in **Appendix A** and **B**, respectively.

6.5 The variability in the 10 AM and PM model runs is demonstrated by **Figures 21, and Figure 22** below. These figures show the number of vehicles on the model network, in each individual run, over the peak periods assessed. The results demonstrate little variability between runs, in the AM and PM, suggesting a high level of model stability.

Figure 21 Model Run Comparison AM

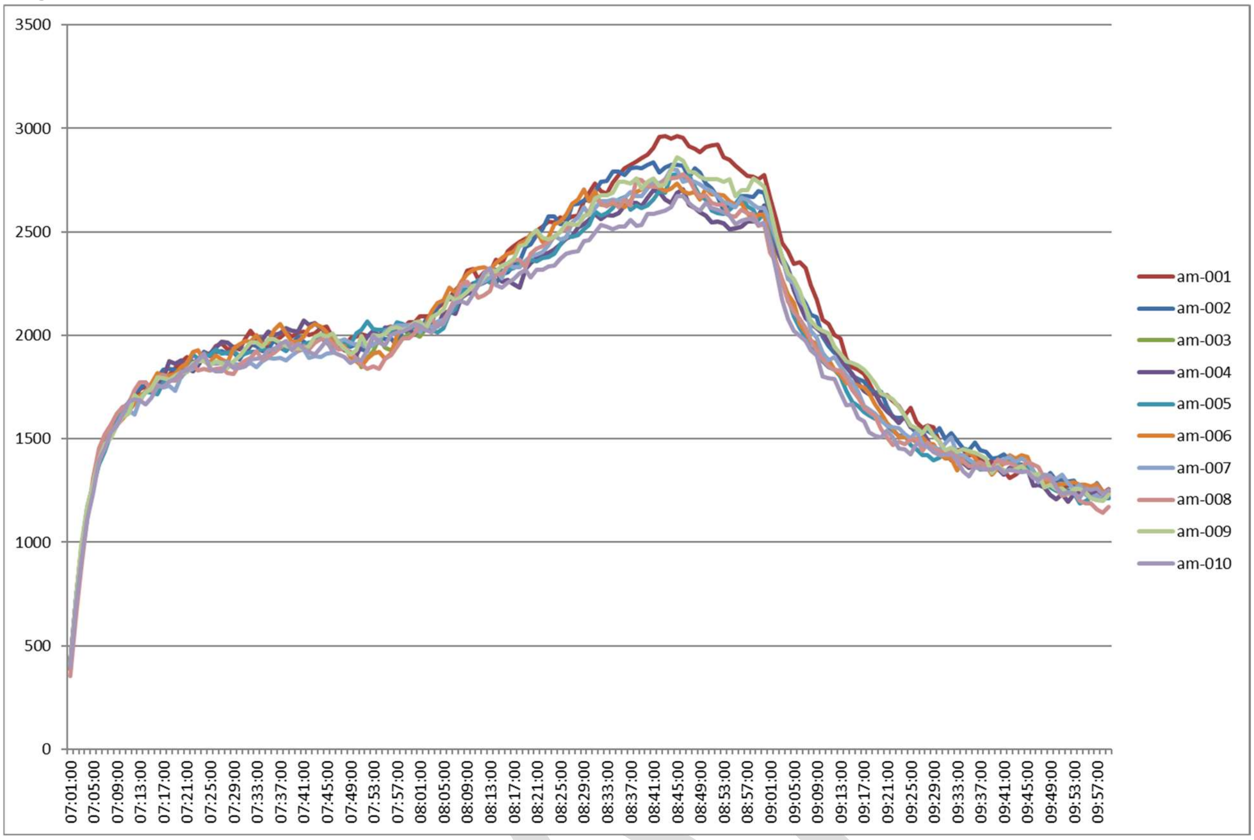
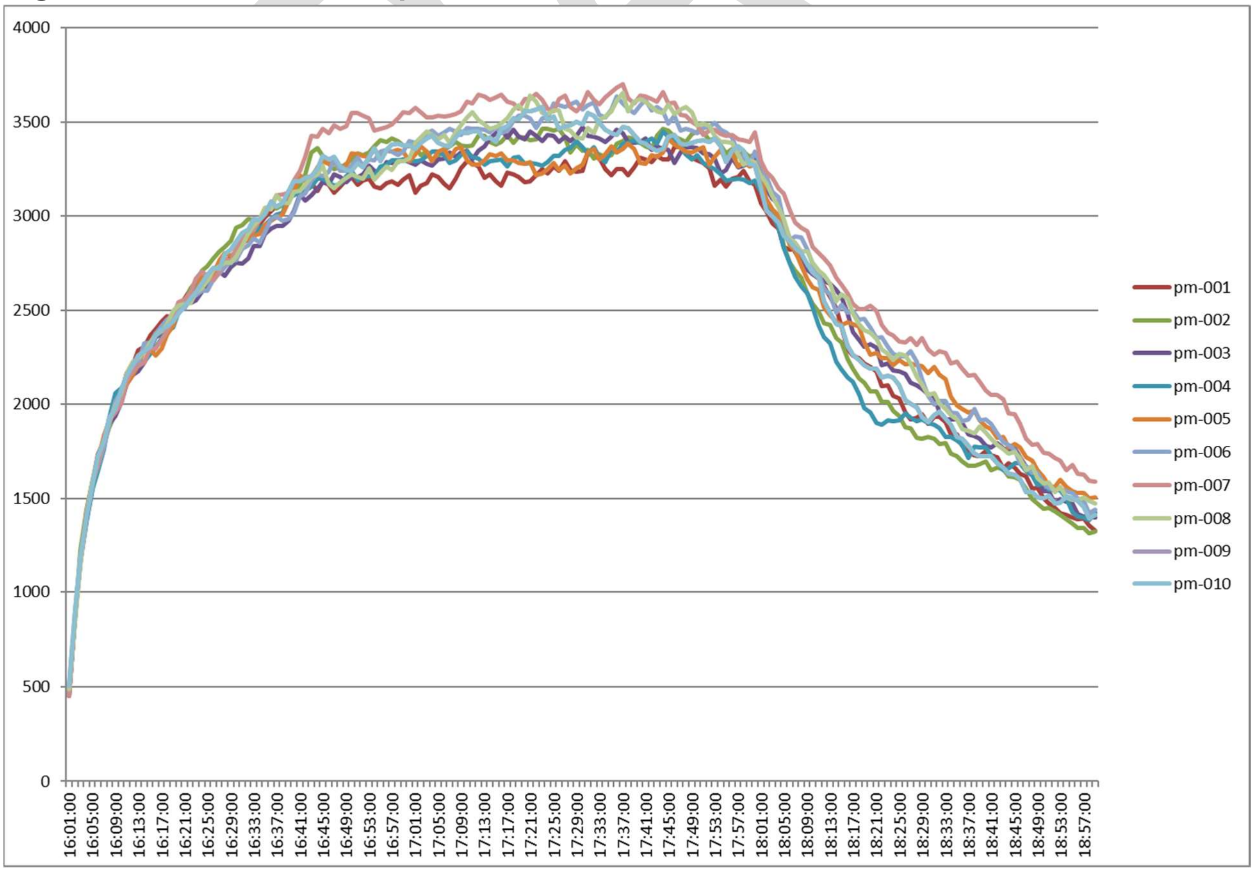


Figure 22 Model Run Comparison PM



TAG Criteria

6.6 The model calibration and validation process has been carried out, where possible, in accordance with the criteria specified within WebTAG unit M3.1. These guidelines are summarised in the following table:

Table 8 Model Assessment Criteria

Criteria and Measure	Acceptability
Assigned Hourly Flows	
Individual flows within 100vph (flows<700vph)	85% of all cases
Individual flows within 15% (flows 700-2700vph)	85% of all cases
Individual flows within 400vph (flows>2700vph)	85% of all cases
GEH statistic: individual flows GEH<5	85% of all cases
Modelled Journey Times	
Times within 15% (or 1 minute, if higher)	85% of all cases

Turn and Link Calibration

6.7 In total 11 two-way link counts, 27 junction count surveys and 4 link counts contained from Highway's England WebTRIS database from April 2021 for the M6 and M65 mainline, were used to assess model calibration. This results in excess of 250 data samples per hour being used to assess model calibration.

6.8 In addition, to this, the sum of the movements from each approach to the surveyed junctions was calculated to provide more than 110 supplementary link counts to assess against the TAG flow assessment criteria.

6.9 When the smaller turning flows are all aggregated to a link flow, it shows that the throughput, as well as the turn counts, are accurate. For example, a series of turning movements may be lower in the model but meet the GEH criteria, but by checking the cumulative link flow on this approach, we can ascertain if the consistently lower number for each turn is contributing to a significantly low flow on the approach link.

6.10 A summary of the overall level of model calibration achieved is provided within the following tables. This assessment is focused on the full set of Turn and Link surveys.

Table 9 Turn Calibration AM

	0700-0800	0800-0900	0900-1000
Counts:	253	255	253
GEH <5	235	242	245
%	93%	95%	97%

Table 10 Turn Calibration IP

	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600
Counts:	254	253	254	251	253	254
GEH <5	232	239	236	230	237	232
%	91%	94%	93%	92%	94%	91%

Table 11 Turn Calibration PM

	1600-1700	1700-1800	1800-1900
Counts:	253	253	250
GEH <5	232	242	237
%	92%	96%	95%

Table 12 Link Flow Calibration AM

	0700-0800	0800-0900	0900-1000
Counts:	112	112	112
GEH <5	104	106	111
%	93%	95%	99%

Table 13 Link Flow Calibration IP

	1000-1100	1100-1200	1200-1300	1300-1400	1400-1500	1500-1600
Counts:	112	112	112	112	112	112
GEH <5	103	106	107	104	105	103
%	92%	95%	96%	93%	94%	92%

Table 14 Link Flow Calibration PM

	1600-1700	1700-1800	1800-1900
Counts:	112	112	112
GEH <5	97	107	108
%	87%	96%	96%

6.11 Analysis of the aforementioned tables reveals that the level of calibration that has been achieved within the presented 12 hour, AM, Inter-Peak and PM periods is of a sufficiently high standard to enable the model to be declared fit for purpose.

6.12 A full breakdown of the GEH comparisons has been provided within **Appendix A** of this report. The lack of any high GEHs along the majority of the model network indicates that the model should be considered accurate and fit for purpose.

Link Flow Calibration

6.13 As noted above, the entry flows have been aggregated for all links that comprise the turning count surveys. This provides an overall level of calibration in the context of purely link flows, since a large number of small turning counts can potentially bias the results of the calibration check.

6.14 The outcome of these comparisons for the traditional AM and PM peak hours have been presented within the following tables.

Table 15: Link Flow Calibration – AM Peak Hour (08:00 to 09:00)

	08:00 to 09:00		
	OBS	MOD	% Pass
<700 within 100 - LOW	72	69	96%
700-2700 within 15% - MED	40	40	100%
>2700 within 400 - HIGH	0	0	n/a
ALL	112	109	97%

Table 16: Link Flow Calibration – PM Peak Hour (17:00 to 18:00)

	17:00 to 18:00		
	OBS	MOD	% Pass
<700 within 100 - LOW	64	61	95%
700-2700 within 15% - MED	48	47	98%
>2700 within 400 - HIGH	0	0	n/a
ALL	112	108	96%

6.15 Analysis of the tables above reveal that, when considering flow calibration levels, the model continues to demonstrate a high level of calibration overall.

6.16 The full 12 modelled hours are calibrated to an extremely high standard and tables for the AM and PM period shoulder hours and full Inter-Peak period are provided within **Appendix B** of this report, for simplicity only these were not presented in the main body of text.

Calibration Summary

6.17 Overall it is reasonable to conclude that a very high level of calibration has been achieved within the AM, IP and PM periods during the model development process. The link, turn and flow assessments demonstrates a high level of adherence to the requirements outlined within TAG.

7 Validation

Overview

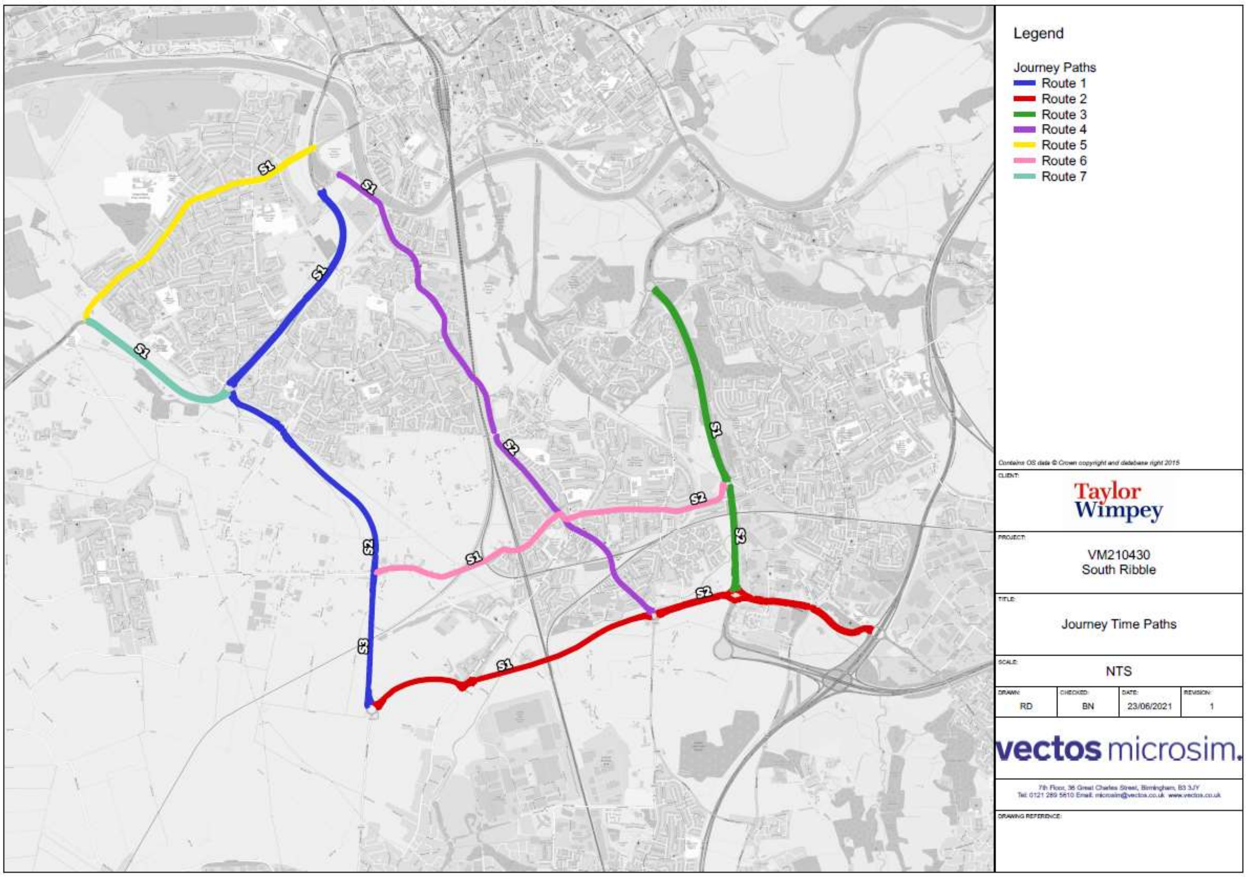
7.1 Model validation is the process of checking the calibrated model against observed traffic data independent of the model development process. The model validation has been undertaken in line with the guidance outlined in WebTAG unit M3.1.

7.2 TAG requires that, once a model has been successfully calibrated, an independent check of the model should be undertaken using data that has not been used to inform any of the model calibration. For the purposes of this model development, TomTom journey time data has been used to inform the model validation checks.

Journey Time Validation

7.3 Validation of the model was carried out against the TomTom journey times. Seven two-way routes were used for the validation. These are illustrated in the following **Figure 23**.

Figure 23 Journey Time Routes



7.4 The routes were split into sections and comparisons where made between the observed and modelled journey times both by each individual section as well as across the entire route. This ensured that the delay on the wider route was attributed to the correct section.

7.5 In terms of the modelled journey time data, each journey time route was coded into the model to reflect the journey path extracted from the TomTom data. Paramics then records the time it takes for every vehicle to traverse the entire length of the path within the model period. This information is collated and then the average journey time calculated for all vehicles, across each model hour.

7.6 This exercise was undertaken for each section of the routes extracted from the Streetwise TomTom database. Summary analysis of the outcome of the section by section and each route comparisons are presented within the following tables and the full analysis is provided within **Appendix C**.

7.7 TAG states 85% or more of modelled journey times must be within 15% (or 1 minute, if higher) of observed journey times for the model to be considered as validated. Summary analysis of the individual route validation is presented within the following tables.

Table 17 Journey Time Validation by Route – AM Peak Hour

Route	Length (m)	Observed (s)	Modelled (s)	Difference	% Difference	Pass/Fail
Route 1 NB	4717	375	332	-43	-11%	PASS
Route 1 SB	4706	328	341	13	4%	PASS
Route 2 EB	4079	476	516	39	8%	PASS
Route 2 WB	4096	422	451	30	7%	PASS
Route 3 NB	2397	127	120	-7	-6%	PASS
Route 3 SB	2406	138	134	-4	-3%	PASS
Route 4 NB	4259	589	593	4	1%	PASS
Route 4 SB	4260	518	541	22	4%	PASS
Route 5 NB	2303	334	325	-10	-3%	PASS
Route 5 SB	2281	356	365	8	2%	PASS
Route 6 EB	3002	456	413	-43	-9%	PASS
Route 6 WB	3004	395	387	-9	-2%	PASS
Route 7 EB	1274	86	112	26	31%	PASS
Route 7 WB	1306	79	64	-15	-19%	PASS

Table 18 Journey Time Validation by Route – Select IP Hour (1200-1300)

Route	Length (m)	Observed (s)	Modelled (s)	Difference	% Difference	Pass/Fail
Route 1 NB	4717	366	314	-52	-14%	PASS
Route 1 SB	4706	325	334	8	3%	PASS
Route 2 EB	4079	423	410	-13	-3%	PASS
Route 2 WB	4096	494	556	62	12%	PASS
Route 3 NB	2397	158	116	-41	-26%	PASS
Route 3 SB	2406	140	130	-9	-7%	PASS
Route 4 NB	4259	426	389	-37	-9%	PASS
Route 4 SB	4260	456	382	-75	-16%	FAIL
Route 5 NB	2303	439	477	38	9%	PASS
Route 5 SB	2281	305	253	-52	-17%	PASS
Route 6 EB	3002	352	314	-38	-11%	PASS
Route 6 WB	3004	393	356	-37	-9%	PASS
Route 7 EB	1274	84	72	-13	-15%	PASS
Route 7 WB	1306	72	62	-11	-15%	PASS

Table 19 Journey Time Validation by Route – PM Peak Hour

Route	Length (m)	Observed (s)	Modelled (s)	Difference	% Difference	Pass/Fail
Route 1 NB	4717	365	336	-29	-8%	PASS
Route 1 SB	4706	332	346	14	4%	PASS
Route 2 EB	4079	455	450	-5	-1%	PASS
Route 2 WB	4096	511	560	49	10%	PASS
Route 3 NB	2397	140	125	-15	-11%	PASS
Route 3 SB	2406	151	134	-17	-11%	PASS
Route 4 NB	4259	513	497	-16	-3%	PASS
Route 4 SB	4260	518	566	48	9%	PASS
Route 5 NB	2303	300	280	-20	-7%	PASS
Route 5 SB	2281	302	318	16	5%	PASS
Route 6 EB	3002	431	461	30	7%	PASS
Route 6 WB	3004	423	440	17	4%	PASS
Route 7 EB	1274	80	69	-12	-14%	PASS
Route 7 WB	1306	71	64	-7	-9%	PASS

7.8 The previous tables demonstrate that, when comparing modelled and observed journey times, both the AM and PM peak hours and selected IP hour meet the required standard with a level of validation in excess of TAG being achieved.

7.9 Analysis of the journey time validation results presented above shows that one route exceeds a 15% difference between modelled and observed delay in AM and PM peak hours and one route exceeds the threshold in the selected IP hour.

Validation Summary

7.10 The validation checks have been undertaken for both AM and PM peak hours and a selected IP hour (12:00-13:00) using observed journey times to inform the validation.

7.11 The analysis revealed that the independent journey time validation conform to the required WebTAG standards in all periods.

8 Summary and Conclusions

Summary

8.1 Vectos has been commissioned by Taylor Wimpey to develop a microsimulation model of the South Ribble, which lies to the south of Preston City Centre. The intention of developing this model is to provide a suitable tool to be used to assess traffic impact of the proposed residential development located south-east of Penwortham town centre.

8.2 The model has been developed in Paramics Discovery Version 24, and captures the A59, A582, A6, B5254 Leyland Road and M6 Junction 29, encompassing the Lower Penwortham and Lostock Hall area, to the south of Preston.

8.3 The model has been developed for the following periods:

- **AM1:** 07:00 to 08:00
- **AM2:** 08:00 to 09:00
- **AM3:** 09:00 to 10:00
- **IP1:** 10:00 to 11:00
- **IP2:** 11:00 to 12:00
- **IP3:** 12:00 to 13:00
- **IP4:** 13:00 to 14:00
- **IP5:** 14:00 to 15:00
- **IP6:** 15:00 to 16:00
- **PM1:** 16:00 to 17:00
- **PM2:** 17:00 to 18:00
- **PM3:** 18:00 to 19:00

8.4 The model has been calibrated in line with modelling guidelines and GEH comparisons have been undertaken using all available observed count data. A summary of the outcome of these comparisons is provided within the following table.

Table 20 Calibration Summary

Period	Turns	Links
07:00-08:00	93%	93%
08:00-09:00	95%	95%
09:00-10:00	97%	99%
10:00-11:00	91%	92%
11:00-12:00	94%	95%
12:00-13:00	93%	96%
13:00-14:00	92%	93%
14:00-15:00	94%	94%
15:00-16:00	91%	92%
16:00-17:00	92%	87%
17:00-18:00	96%	96%
18:00-19:00	95%	96%

8.5 Independent validation checks have been undertaken using Tom Tom journey time data. Based on the outcome of the journey time comparisons, whereby the AM and PM peak achieved over 85% pass rate, it is reasonable to conclude that the model demonstrates an appropriate level of validation.

Conclusion

8.6 The model has been calibrated for the entire AM (07:00 to 10:00), IP (10:00-16:00) and PM (16:00 to 19:00) time periods.

8.7 A high degree of calibration has been achieved for all hours and, in particular, the ability to demonstrate that the AM and PM peak hour calibration levels exceed those required by TAG, which provides the necessary evidence to conclude that this model provides a realistic and accurate representation of traffic operations within the study area.

8.8 The model has subsequently been validated against observed journey times and confirmed to provide a good level of validation in the peak hours.

Appendix A Turn Count Calibration

VM210430 South Ribble - Calibration (All)

	All Vehicles																																			
	07:00:00			08:00:00			09:00:00			10:00:00			11:00:00			12:00:00			13:00:00			14:00:00			15:00:00			16:00:00			17:00:00			18:00:00		
	253			255			253			254			253			254			251			253			254			253			253			250		
	235			242			245			232			239			236			230			237			232			232			242			237		
GEH<5	93%			95%			97%			91%			94%			93%			92%			94%			91%			92%			96%			95%		
<3	208	82.2%		197	77.3%		215	85.0%		205	80.7%		217	85.8%		207	81.5%		204	81.3%		217	85.8%		202	79.5%		190	75.1%		213	84.2%		208	83.2%	
<4	224	88.5%		226	88.6%		231	91.3%		225	88.6%		229	90.5%		225	88.6%		221	88.0%		228	90.1%		223	87.8%		214	84.6%		227	89.7%		229	91.6%	
<5	233	92.1%		240	94.1%		243	96.0%		232	91.3%		239	94.5%		236	92.9%		230	91.6%		237	93.7%		232	91.3%		232	91.7%		242	95.7%		237	94.8%	
<6	241	95.3%		244	95.7%		247	97.6%		239	94.1%		244	96.4%		242	95.3%		237	94.4%		239	94.5%		241	94.9%		240	94.9%		245	96.8%		245	98.0%	
<7	246	97.2%		249	97.6%		250	98.8%		245	96.5%		246	97.2%		244	96.1%		244	97.2%		246	97.2%		249	98.0%		248	98.0%		247	97.6%		248	99.2%	
<8	250	98.8%		250	98.0%		251	99.2%		249	98.0%		249	98.4%		249	98.0%		247	98.4%		248	98.0%		250	98.4%		249	98.4%		248	98.0%		249	99.6%	
<9	250	98.8%		252	98.8%		253	100.0%		253	99.6%		252	99.6%		252	99.2%		249	99.2%		250	98.8%		251	98.8%		250	98.8%		250	98.8%		249	99.6%	
<10	251	99.2%	2	254	99.6%	1	253	100.0%	0	253	99.6%	1	252	99.6%	1	253	99.6%	1	250	99.6%	1	253	100.0%	0	252	99.2%	2	251	99.2%	2	252	99.6%	1	250	100.0%	0

26 27 28 29 30 31 32 33 34 35 36 37

							All Vehicles																																			
							0700 to 0800			0800 to 0900			0900 to 1000			1000 to 1100			1100 to 1200			1200 to 1300			1300 to 1400			1400 to 1500			1500 to 1600			1600 to 1700			1700 to 1800			1800 to 1900		
Survey Type	Ref	Junction	Approach	To	Turn Movement/Direction	Reference	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH
MCC	MCC1	A59 / John Horrocks Way	A59 Liverpool Road N	A59 Liverpool Road SW	A - B	907::890to890::911	207	196	1	451	404	2	230	247	1	212	199	1	250	246	0	289	275	1	283	279	0	305	304	0	386	351	2	344	345	0	374	390	1	274	295	1
MCC	MCC1	A59 / John Horrocks Way	A59 Liverpool Road N	John Horrocks Way SE	A - C	907::890to890::909	73	77	0	132	116	1	85	109	2	63	65	0	79	75	0	57	67	1	45	66	3	71	69	0	109	77	3	76	84	1	97	102	1	62	82	2
MCC	MCC1	A59 / John Horrocks Way	A59 Liverpool Road SW	A59 Liverpool Road N	B - A	908::890to890::906	163	159	0	456	392	3	218	227	1	210	187	2	242	198	3	261	207	4	266	201	4	304	294	1	384	338	2	305	275	2	309	309	0	219	222	0
MCC	MCC1	A59 / John Horrocks Way	A59 Liverpool Road SW	John Horrocks Way SE	B - C	908::890to890::909	752	706	2	782	801	1	511	552	2	448	431	1	388	383	0	433	430	0	427	423	0	453	410	2	566	558	0	604	579	1	569	573	0	414	436	1
MCC	MCC1	A59 / John Horrocks Way	John Horrocks Way SE	A59 Liverpool Road N	C - A	910::890to890::906	46	55	1	130	110	2	54	78	3	41	43	0	38	42	1	61	53	1	50	43	1	66	59	1	99	77	2	88	77	1	124	106	2	74	75	0
MCC	MCC1	A59 / John Horrocks Way	John Horrocks Way SE	A59 Liverpool Road SW	C - B	910::890to890::911	486	479	0	637	608	1	375	440	3	340	324	1	332	367	2	395	433	2	416	447	1	468	472	0	526	589	3	683	610	3	738	722	1	446	477	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way NE	Bank Top Road NW	A - B	771::772to779::1074	13	14	0	36	26	2	20	20	0	19	23	1	23	23	0	26	32	1	26	28	0	23	28	1	47	55	1	44	44	0	65	59	1	46	47	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way NE	John Horrocks Way SW	A - C	771::772to777::790	404	398	0	499	460	2	280	296	1	250	257	0	255	263	0	324	331	0	332	338	0	383	367	1	434	446	1	596	536	3	645	593	2	365	377	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way NE	A582 Golden Way SE	A - D	771::772to775::788	383	391	0	379	362	1	333	377	2	328	317	1	339	358	1	363	375	1	403	394	0	430	394	2	518	506	1	604	615	0	567	607	2	357	357	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way NE	Millbrook Way E	A - E	771::772to773::786	12	8	1	13	10	1	18	13	1	24	12	3	17	12	1	24	24	0	24	25	0	28	23	1	22	22	0	23	35	2	36	43	1	32	32	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Bank Top Road NW	A582 Golden Way NE	B - A	785::784to780::1073	67	60	1	71	58	2	45	61	2	26	30	1	28	28	0	44	43	0	32	33	0	26	27	0	43	30	2	38	34	1	34	34	0	35	32	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Bank Top Road NW	John Horrocks Way SW	B - C	785::784to777::790	12	13	0	30	25	1	7	11	1	8	8	0	7	6	0	8	10	1	4	6	1	10	14	1	12	12	0	7	9	1	11	13	1	8	9	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Bank Top Road NW	A582 Golden Way SE	B - D	785::784to775::788	51	41	1	43	56	2	55	65	1	43	36	1	43	37	1	49	38	2	44	40	1	49	41	1	137	79	6	50	39	2	64	55	1	38	39	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Bank Top Road NW	Millbrook Way E	B - E	785::784to773::786	10	13	1	42	44	0	16	23	2	9	10	0	19	20	0	27	36	2	11	10	0	12	16	1	42	33	1	19	25	1	21	26	1	24	21	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	John Horrocks Way SW	A582 Golden Way NE	C - A	791::778to780::1073	709	646	2	710	721	0	450	520	3	378	348	2	341	307	2	357	345	1	360	348	1	352	314	2	456	422	2	518	504	1	474	479	0	364	374	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	John Horrocks Way SW	Bank Top Road NW	C - B	791::778to779::1074	1	4	2	16	16	0	8	8	0	6	6	0	9	11	1	9	10	0	7	8	0	6	7	0	17	16	0	6	7	0	24	24	0	9	10	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	John Horrocks Way SW	A582 Golden Way SE	C - D	791::778to775::788	96	103	1	143	143	0	100	131	3	98	117	2	99	119	2	85	117	3	76	114	4	111	123	1	132	152	2	108	109	0	119	134	1	81	104	2
MCC	MCC2	A582 / Golden Way / John Horrocks Way	John Horrocks Way SW	Millbrook Way E	C - E	791::778to773::786	12	12	0	47	34	2	25	23	0	27	22	1	22	16	1	32	23	2	29	17	3	42	31	2	51	43	1	46	39	1	49	34	2	35	31	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way SE	A582 Golden Way NE	D - A	789::776to780::1073	546	476	3	637	572	3	482	514	1	360	319	2	414	423	0	377	377	0	360	356	0	410	386	1	407	407	0	533	487	2	503	537	1	331	364	2
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way SE	Bank Top Road NW	D - B	789::776to779::1074	29	31	0	144	138	1	44	65	3	39	27	2	51	39	2	55	38	2	48	41	1	95	67	3	101	73	3	90	88	0	101	96	1	70	86	2
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way SE	John Horrocks Way SW	D - C	789::776to777::790	90	92	0	177	177	0	91	145	5	75	91	2	84	119	3	79	123	4	86	123	4	113	134	2	120	155	3	125	130	0	147	177	2	101	123	2
MCC	MCC2	A582 / Golden Way / John Horrocks Way	A582 Golden Way SE	Millbrook Way E	D - E	789::776to773::786	35	32	1	57	45	2	46	36	2	50	36	2	73	59	2	80	62	2	55	45	1	57	43	2	63	52	1	71	73	0	63	48	2	60	43	2
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Millbrook Way E	A582 Golden Way NE	E - A	786::774to780::1073	13	8	2	19	11	2	11	10	0	15	8	2	17	14	1	13	12	0	17	12	1	15	9	2	8	10	1	14	12	1	16	10	2	13	9	1
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Millbrook Way E	Bank Top Road NW	E - B	786::774to779::1074	3	12	3	6	19	4	12	13	0	7	7	0	16	16	0	11	12	0	13	12	0	13	11	1	25	27	0	19	12	2	20	23	1	24	22	0
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Millbrook Way E	John Horrocks Way SW	E - C	786::774to777::790	37	37	0	69	62	1	43	40	0	41	25	3	32	19	3	44	25	3	40	19	4	34	23	2	54	47	1	45	40	1	39	45	1	50	27	4
MCC	MCC2	A582 / Golden Way / John Horrocks Way	Millbrook Way E	A582 Golden Way SE	E - D	786::774to775::788	55	52	0	82	76	1	76	90	2	73	64	1	78	70	1	107	99	1	91	83	1	85	64	2	99	83	2	70	60	1	95	92	0	76	114	4
														0			0			0			0			0			0			0			0			0			0	
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Cop Lane NW	Millbrook Way SW	A - B	813::810to810::873	30	33	1	62	68	1	53	77	3	55	55	0	51	49	0	68	66	0	56	56	0	52	47	1	73	86	1	49	48	0	39	57	3	38	44	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Cop Lane NW	Cop Lane SE	A - C	813::810to810::811	97	101	0	232	287	3	149	167	1	115	116	0	133	132	0	188	202	1	142	183	3	161	163	0	269	272	0	183	137	4	192	211	1	166	176	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Cop Lane NW	A582 Golden Way off-slip NE	A - D	813::810to810::875	0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Millbrook Way SW	Cop Lane NW	B - A	873::810to810::813	32	41	1	61	71	1	59	70	1	63	70	1	69	80	1	74	83	1	66	75	1	63	73	1	89	93	0	84	81	0	54	64	1	57	64	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Millbrook Way SW	Cop Lane SE	B - C	873::810to810::811	17	19	0	49	47	0	35	36	0	41	33	1	59	49	1	67	54	2	63	48	2	60	49	1	93	84	1	62	67	1	75	70	1	68	78	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Millbrook Way SW	A582 Golden Way off-slip NE	B - D	873::810to810::875	0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Cop Lane SE	Cop Lane NW	C - A	811::810to810::813	232	189	3	454	417	2	248	255	0	230	229	0	264	237	2	261	263	0	258	264	0	290	288	0	362	365	0	309	288	1	347	358	1	248	264	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Cop Lane SE	Millbrook Way SW	C - B	811::810to810::873	39	44	1	59	85	3	59	67	1	61	59	0	52	54	0	83	84	0	49	49	0	49	52	0	84	85	0	51	57	1	76	97	2	82	75	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	Cop Lane SE	A582 Golden Way off-slip NE	C - D	811::810to810::875	0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	A582 Golden Way off-slip NE	Cop Lane NW	D - A	875::810to810::813	38	40	0	75	70	1	36	24	2	54	24	5	60	63	0	65	67	0	59	60	0	92	98	1	111	98	1	111	96	1	104	95	1	75	68	1
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	A582 Golden Way off-slip NE	Millbrook Way SW	D - B	875::810to810::873	13	15	1	16	19	1	23	22	0	21	20	0	23	17	1	45	27	3	42	21	4	30	20	2	32	14	4	45	25	3	35	21	3	31	18	3
MCC	MCC3A	A582 / Cop Lane / Millbrook Way	A582 Golden Way off-slip NE	Cop Lane SE	D - C	875::810to810::811	46	13	6	74	54	3	65	52	2	73	49	3	83	78	1	107	84	2	103	84	2	109	87	2	130	85	4	167	90	7	147	101	4	121	95	3
														0			0			0			0			0			0			0			0			0			0	
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cop Lane NW	Cronwell Road SW	A - B	814::813to813::874	1	2	1	2	2	0	0	2		1	2	1	1	2	1	2	2	0	0	1		5	6	0	4	3	1	5	3	1	4	3	1	3	3	0
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cop Lane NW	Cop Lane SE	A - C	814::813to813::810	123	135	1	293	349	3	198	236	3	171	170	0	178	177	0	253	265	1	192	227	2	203	208	0	336	348	1	234	183	4	219	261	3	196	213	1
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cop Lane NW	A582 Golden Way on-slip NE	A - D	1099::814to814::1075	107	90	2	153	133	2	85	82	0	64	42	3	46	46	0	73	75	0	75	89	2	68	71	0	111	113	0	66	53	2	62	44	2	48	38	2
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cronwell Road SW	Cop Lane NW	B - A	874::813to813::814	2	2	0	3	2	1	2	2	0	2	3	1	3	4	1	1	2	1	3	5	1	7	8	0	4	4	0	1	2	1	4	3	1	2	2	0
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cronwell Road SW	Cop Lane SE	B - C	874::813to813::810	4	2	1	7	8	0	2	4	1	2	3	1	6	4	1	6	7	0	3	5	1	7	6	0	4	7	1	2	4	1	8	7	0	6	7	0
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cronwell Road SW	A582 Golden Way on-slip NE	B - D	874::813to813::876	5	11	2	5	16	3	6	6	0	4	3	1	5	3	1	6	5	0	2	2	0	4	4	0	5	4	0	1	9	4	3	3	0	3	3	0
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cop Lane SE	Cop Lane NW	C - A	810::813to813::814	165	146	2	436	385	3	204	223	1	219	207	1	258	260	0	287	302	1	254	278	1	365	357	0	433	441	0	381	326	3	388	398	1	246	283	2
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cop Lane SE	Cronwell Road SW	C - B	810::813to813::874	5	10	2	9	21	3	9	10	0	4	10	2	7	14	2	11	16	1	7	13	2	7	17	3	16	24	2	10	25	4	17	31	3	16	25	2
MCC	MCC3B	A582 / Cop Lane / Cromwell Rd	Cop Lane SE	A582 Golden Way on-slip NE	C - D	810::813to813::876	139	113	2	144	154	1	123	113	1	121	106	1	123	102	2	111	99	1	110	107	0	85	83	0	107	95	1	114	110	0	103	90	1	114	84	3
														0			0			0			0			0			0			0			0			0			0	
MCC	MCC4	A59 / Liverpool Rd	A59 Liverpool Road NE	A59 Liverpool Road SW	A - B	719::714to714::717	137	107	3	311	244	4	205	168	3	205	188	1	233	216	1	276	248	2	247	220	2	296	265	2	240	159	6	302	264	2	398	365	2	231	217	1
MCC	MCC4	A59 / Liverpool Rd	A59 Liverpool Road NE	A59 S	A - C	720::719to719::718	260	251	1	355	357	0	284	268	1	331	303	2	364	368	0	431	421	0	414	409	0	520	495	1	584	680	4	687	661	1	717	624	4	385	377	0
MCC	MCC4	A59 / Liverpool Rd	A59 Liverpool Road SW	A59 Liverpool Road NE	B - A	717::714to714::719	201	168	2	332	227	6	263	233	2	222	171	4	264	189	5	278	194	5	291	196	6	228	178	4	249	181	5	259	223	2	251	226	2	219	202	1
MCC	MCC4	A59 / Liverpool Rd	A59 Liverpool Road SW	A59 S	B - C	717::714to714::718	153	142	1	320	203	7	162	168	0	113	127	1	114	129	1	135	124	1	151	113	3	121	133	1	168	169	0	154	179	2	189	190	0	113	144	3
MCC	MCC4	A59 / Liverpool Rd	A59 S	A59 Liverpool Road NE	C - A	715::714to714::719	186	190	0	262	269	0	203	249	3	131	132	0	161	181	2	156	205	4	131	201	5	134	179	4	257	199	4	179	171	1	272	207	4	166	179	1
MCC	MCC4	A59 / Liverpool Rd	A59 S	A59 Liverpool Road SW	C - B	716::717to717::721	105	116	1	313	285	2	137	160	2	184	177	1	207	201	0	219	214	0	192	180	1	254	227	2	290	305	1	251	223	2	277	261	1	190	202	1
																	0			0			0			0			0			0			0			0			0	
MCC	MCC5	A59 / Golden Way	A59 NW	A582 Golden Way SE	A - B	696::688to691::692	832	771	2	878	803	3	646	610	1	642	537	4	668	636	1	808	738	3	810	744	2	915	808	4	1008	831	6	1304	1175	4	1294	1211	2	865	805	2
MCC	MCC5	A59 / Golden Way	A59 NW	A59 E	A - C	696::688to689::690	194	200	0	168	176	1	169	177	1	151	163	1	141	153	1	183	199	1	182	206	2	199	226	2	206	256	3	253	303	3	322	319	0	226	273	3
MCC	MCC5	A59 / Golden Way	A582 Golden Way SE	A59 NW	B - A	694::686to687::698	1496	1325	5	1598	1539	1	1139	1185	1	909	744	6	893	832	2	912	839	2	908	821	3	880	796	3	1016	940	2	1169	1068	3	1097	1081	0	863	829	1
MCC	MCC5	A59 / Golden Way	A582 Golden Way SE	A59 E	B - C	694::686to689::690	43	84	5	122	145	2	87	151	6	161	85	7	165	96	6	169	123	4	161	130	3	180	101	7	201	146	4	96	109	1	86	129	4	62	96	4
MCC	MCC5	A59 / Golden Way	A59 E	A59 NW	C - A	684::685to687::698	635	645	0	624	654	1	453	458	0	338	311	1	345	341	0	328	338	1	381	373	0	344	364	1	414	404	0	439	349	5	443	440	0	356	397	2
MCC	MCC5	A59 / Golden Way	A59 E	A582 Golden Way SE	C - B	684::685to691::692	115	118	0	207	198	1	119	181	5	140	184	3	151	185	3	172	206	2	169	204	3	219	227	1	334	391	3	302	317	1	304	314	1	134	152	2
MCC	MCC5A6A	A59 Slip	A59 NW	A59 NE	5A - 6A	702::703to703::706	42	31	2	129	97	3	80	58	3	107	86	2	118	109	1	115	109	1	99	92	1	137	132	0	142	171	2	119	112	1	145	127	2	92	86	1
														0			0			0			0			0			0			0			0			0			0	
MCC	MCC6	A59 / B5254 Leyland Rd	A59 NW	A59 SW	A - B	683::679to676::681	164	129	3	300	228	4	171	186	1	180	179	0	167	185	1	189	196	1	211	196	1	242	219	2	348	396	2	298	311	1	349	305	2	159	138	2
MCC	MCC6	A59 / B5254 Leyland Rd	A59 NW	B5254 Leyland Road SE	A - C	683::679to680::662	247	263	1	371	332	2	276	251	2	261	250	1	316	312	0	373	349	1	355	325	2	398	406	0	502	453	2	536	527	0	557	508	2	340	386	2
MCC	MCC6	A59 / B5254 Leyland Rd	A59 SW	A59 NW	B - A	682::677to678::683	21	70	7	81	116	4	42	105	7	39	67	4	43	82	5	42	104	7	43	112	8	55	83	3	63	122	6	61	76	2	69	99	3	46	69	3
MCC	MCC6	A59 / B5254 Leyland Rd	A59 SW	B5254 Leyland Road SE	B - C	682::677to680::662	208	202	0	205	195	1	219	215	0	165	169	0	167	156	1	208	208	0	205	213	1	222	232	1	242	266	2	290	320	2	338	337	0	240	291	3
MCC	MCC6	A59 / B5254 Leyland Rd	B5254 Leyland Road SE	A59 NW	C - A	662::675to678::683	230	204	2	368	344	1	227	243	1	172	158	1	219	192	2	228	204	2	192	177	1	201	192	1	234	211	2	249	209	3	244	242	0	213	226	1
MCC	MCC6	A59 / B5254 Leyland Rd	B5254 Leyland Road SE	A59 SW	C - B	662::675to676::681	589	632	2	531	608	3	404	438	2	292	308	1	329	332	0	316	340	1	334	371	2	328	361	2	361	385	1	442	348	5	406	435	1	323	399	4
								0			0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC7	B5254 Leyland Rd / Marshalls Brow	B5254 Leyland Road N	Marshalls Brow W	A - B	673::668to670::664	34	30	1	91	94	0	77	79	0	69	74	1	76	83	1	92	97	1	95	105	1	87	90	0	139	143	0	115	139	2	128	126	0	104	143	4
MCC	MCC7	B5254 Leyland Rd / Marshalls Brow	B5254 Leyland Road N	B5254 Leyland Road S	A - C	673::668to669::674	449	502	2	505	525	1	406	431	1	362	365	0	386	387	0	492	469	1	482	456	1	516	521	0	631	600	1	709	696	0	772	719	2	479	554	3
MCC	MCC7	B5254 Leyland Rd / Marshalls Brow	Marshalls Brow W	B5254 Leyland Road N	B - A	664::670to668::673	90	99	1	197	150	4	131	125	1	111	109	0	115	118	0	132	132	0	103	105	0	136	134	0	158	165	1	123	113	1	97	102	1	105	105	0
MCC	MCC7	B5254 Leyland Rd / Marshalls Brow	Marshalls Brow W	B5254 Leyland Road S	B - C	664::670to669::674	41	55	2	53	60	1	31	48	3	41	39	0	34	35	0	31	29	0	31	31	0	31	26	1	51	70	2	44	39	1	54	77	3	48	64	2
MCC	MCC7	B5254 Leyland Rd / Marshalls Brow	B5254 Leyland Road S	B5254 Leyland Road N	C - A	674::669to668::673	755	762	0	763	853	3	526	576	2	445	407	2	474	471	0	510	489	1	484	493	0	499	505	0	539	503	2	645	520	5	583	625	2	457	539	4
MCC	MCC7	B5254 Leyland Rd / Marshalls Brow	B5254 Leyland Road S	Marshalls Brow W	C - B	674::669to670::664	19	27	2	34	39	1	29	36	1	31	36	1	34	38	1	38	38	0	38	48	2	36	42	1	43	46	0	54	57	0	53	62	1	51	67	2
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC8	A582 Penwortham Way / Pope Lane	A582 Golden Way NW	Pope Lane SW	A - B	833::838to839::819	54	54	0	84	69	2	67	76	1	54	53	0	78	76	0	88	91	0	79	84	1	89	94	1	125	118	1	118	120	0	125	127	0	63	122	6
MCC	MCC8	A582 Penwortham Way / Pope Lane	A582 Golden Way NW	A582 Penwortham Way SE	A - C	833::838to838::821	523	498	1	585	529	2	470	557	4	441	422	1	429	447	1	481	501	1	494	499	0	534	467	3	659	591	3	643	623	1	680	682	0	440	440	0
MCC	MCC8	A582 Penwortham Way / Pope Lane	A582 Golden Way NW	Pope Lane NE	A - D	833::1071to1071::1185	13	24	3	77	43	4	37	40	0	47	42	1	46	55	1	39	39	0	43	49	1	45	58	2	112	108	0	46	48	0	60	76	2	49	71	3
MCC	MCC8	A582 Penwortham Way / Pope Lane	Pope Lane SW	A582 Golden Way NW	B - A	823::1072to1072::827	93	68	3	198	121	6	115	101	1	83	52	4	87	88	0	101	90	1	85	77	1	101	83	2	139	106	3	133	89	4	134	86	5	80	78	0
MCC	MCC8	A582 Penwortham Way / Pope Lane	Pope Lane SW	A582 Penwortham Way SE	B - C	823::839to838::821	92	67	3	99	56	5	42	40	0	41	32	1	35	30	1	44	39	1	33	34	0	51	32	3	76	30	6	86	42	6	88	36	7	32	21	2
MCC	MCC8	A582 Penwortham Way / Pope Lane	Pope Lane SW	Pope Lane NE	B - D	823::839to838::835	51	55	1	135	112	2	81	79	0	71	64	1	52	42	1	67	62	1	63	67	0	72	76	0	130	118	1	108	63	5	119	66	6	77	66	1
MCC	MCC8	A582 Penwortham Way / Pope Lane	A582 Penwortham Way SE	A582 Golden Way NW	C - A	817::839to839::827	544	519	1	677	723	2	477	591	5	403	370	2	462	486	1	438	442	0	418	415	0	509	463	2	476	480	0	614	635	1	613	720	4	418	464	2
MCC	MCC8	A582 Penwortham Way / Pope Lane	A582 Penwortham Way SE	Pope Lane SW	C - B	817::1184to1184::1070	64	2	11	97	2	14	46	2	9	33	3	7	41	2	8	36	1	8	40	1	9	49	2	9	65	1	11	68	5	10	81	5	12	46	1	9
MCC	MCC8	A582 Penwortham Way / Pope Lane	A582 Penwortham Way SE	Pope Lane NE	C - D	817::839to838::835	73	41	4	86	80	1	83	64	2	75	57	2	76	61	2	82	63	2	112	87	3	103	76	3	108	95	1	124	97	3	151	136	1	89	85	0
MCC	MCC8	A582 Penwortham Way / Pope Lane	Pope Lane NE	A582 Golden Way NW	D - A	822::838to839::827	62	46	2	150	96	5	52	58	1	45	53	1	51	67	2	45	68	3	57	73	2	60	85	3	81	105	2	73	62	1	61	49	2	52	71	2
MCC	MCC8	A582 Penwortham Way / Pope Lane	Pope Lane NE	Pope Lane SW	D - B	822::838to839::819	77	73	0	143	128	1	60	57	0	76	74	0	67	71	0	85	86	0	87	89	0	99	92	1	98	88	1	103	89	1	100	109	1	65	76	1
MCC	MCC8	A582 Penwortham Way / Pope Lane	Pope Lane NE	A582 Penwortham Way SE	D - C	822::1069to1069::821	133	92	4	175	128	4	125	123	0	98	77	2	111	100	1	109	91	2	121	113	1	133	102	3	148	116	3	113	77	4	116	96	2	78	64	2
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC9	B5254 Leyland Rd / New Lane	B5254 Leyland Road N	New Lane W	A - B	641::640to640::871	23	21	0	82	64	2	75	71	0	59	53	1	75	76	0	72	70	0	82	82	0	80	75	1	84	84	0	80	58	3	77	59	2	68	62	1
MCC	MCC9	B5254 Leyland Rd / New Lane	B5254 Leyland Road N	B5254 Leyland Road S	A - C	641::640to640::639	469	556	4	544	558	1	427	445	1	372	370	0	404	399	0	508	471	2	485	464	1	517	521	0	620	630	0	723	691	1	753	743	0	455	548	4
MCC	MCC9	B5254 Leyland Rd / New Lane	New Lane W	B5254 Leyland Road N	B - A	871::640to640::641	43	51	1	58	70	2	49	58	1	42	44	0	30	35	1	57	60	0	35	42	1	38	49	2	39	35	1	45	40	1	35	32	1	43	44	0
MCC	MCC9	B5254 Leyland Rd / New Lane	New Lane W	B5254 Leyland Road S	B - C	871::640to640::639	110	118	1	128	175	4	111	170	5	87	101	1	78	114	4	97	141	4	96	158	6	81	131	5	126	200	6	104	124	2	123	163	3	106	157	4
MCC	MCC9	B5254 Leyland Rd / New Lane	B5254 Leyland Road S	B5254 Leyland Road N	C - A	639::640to640::641	734	756	1	726	851	4	486	554	3	419	403	1	461	475	1	455	483	1	479	510	1	473	516	2	505	517	1	622	549	3	601	653	2	474	557	4
MCC	MCC9	B5254 Leyland Rd / New Lane	B5254 Leyland Road S	New Lane W	C - B	639::640to640::871	104	104	0	201	219	1	112	142	3	120	129	1	119	152	3	135	168	3	119	154	3	163	181	1	215	231	1	215	192	2	216	257	3	169	210	3
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC10	B5254 Leyland Rd / The Cawsey	B5254 Leyland Road N	Bee Lane W	A - B	551::552to547::548	2	0	2	8	0	4	6	0	3	4	0	3	7	0	4	8	0	4	7	0	4	1	0	1	7	0	4	4	0	3	4	0	3	7	0	4
MCC	MCC10	B5254 Leyland Rd / The Cawsey	B5254 Leyland Road N	B5254 Leyland Road S	A - C	551::552to555::545	482	482	0	460	475	1	428	440	1	343	323	1	379	366	1	447	423	1	430	427	0	456	453	0	487	528	2	550	537	1	581	591	0	382	480	5
MCC	MCC10	B5254 Leyland Rd / The Cawsey	B5254 Leyland Road N	The Cawsey E	A - D	551::552to553::542	183	170	1	269	212	4	166	138	2	143	117	2	137	125	1	176	160	1	183	167	1	182	175	1	279	272	0	307	215	6	327	240	5	180	165	1
MCC	MCC10	B5254 Leyland Rd / The Cawsey	Bee Lane W	B5254 Leyland Road N	B - A	548::549to550::551	5	0	3	9	0	4	8	0	4	4	0	3	9	0	4	8	0	4	8	0	4	10	0	4	6	0	3	4	0	3	5	0	3	4	0	3
MCC	MCC10	B5254 Leyland Rd / The Cawsey	Bee Lane W	B5254 Leyland Road S	B - C	548::549to555::545	3	0	2	2	0	2	5	0	3	7	0	4	4	0	3	6	0	3	6	0	3	1	0	1	2	0	2	3	0	2	0	0		3	0	2
MCC	MCC10	B5254 Leyland Rd / The Cawsey	Bee Lane W	The Cawsey E	B - D	548::549to553::542	3	0	2	6	0	3	4	0	3	1	0	1	4	0	3	4	0	3	4	0	3	4	0	3	2	0	2	8	0	4	1	0	1	2	0	2
MCC	MCC10	B5254 Leyland Rd / The Cawsey	B5254 Leyland Road S	B5254 Leyland Road N	C - A	545::546to550::551	611	554	2	617	630	1	469	492	1	418	384	2	474	456	1	460	461	0	471	477	0	493	487	0	586	492	4	640	496	6	603	600	0	465	516	2
MCC	MCC10	B5254 Leyland Rd / The Cawsey	B5254 Leyland Road S	Bee Lane W	C - B	545::546to547::548	1	0	1	6	0	3	4	0	3	6	0	3	4	0	3	3	0	2	8	0	4	4	0	3	1	0	1	8	0	4	1	0	1	3	0	2

MCC	MCC10	B5254 Leyland Rd / The Cawsey	B5254 Leyland Road S	The Cawsey E	C - D	545::546to553::542	75	88	1	88	111	2	58	69	1	59	53	1	56	53	0	66	64	0	74	75	0	65	56	1	118	105	1	95	90	1	115	123	1	78	109	3
MCC	MCC10	B5254 Leyland Rd / The Cawsey	The Cawsey E	B5254 Leyland Road N	D - A	542::554to550::551	248	235	1	346	333	1	148	145	0	149	127	2	161	136	2	165	145	2	170	150	2	203	183	1	240	230	1	311	236	5	328	299	2	231	217	1
MCC	MCC10	B5254 Leyland Rd / The Cawsey	The Cawsey E	Bee Lane W	D - B	542::554to547::548	3	0	2	2	0	2	2	0	2	3	0	2	2	0	2	4	0	3	3	0	2	2	0	2	4	0	3	5	0	3	5	0	3	3	0	2
MCC	MCC10	B5254 Leyland Rd / The Cawsey	The Cawsey E	B5254 Leyland Road S	D - C	542::554to555::545	84	121	4	109	110	0	70	48	3	59	64	1	76	87	1	90	103	1	66	64	0	96	125	3	102	118	2	99	98	0	106	85	2	98	91	1
														0			0			0			0			0			0			0			0			0			0	
MCC	MCC11	A6 London Way / Brownedge Rd	A6 London Way N	B5257 Brownedge Road W	A - B	595::569to566::450	29	23	1	54	45	1	62	51	1	67	57	1	61	58	0	87	83	0	74	75	0	97	87	1	85	81	0	100	85	2	88	80	1	69	53	2
MCC	MCC11	A6 London Way / Brownedge Rd	A6 London Way N	A6 London Way S	A - C	595::569to211::212	644	605	2	720	662	2	574	578	0	592	574	1	672	682	0	753	737	1	783	781	0	775	757	1	898	890	0	1125	1086	1	1060	1051	0	663	676	1
MCC	MCC11	A6 London Way / Brownedge Rd	A6 London Way N	B5257 Brownedge Road E	A - D	595::569to570::573	35	33	0	80	92	1	52	52	0	55	57	0	70	70	0	80	77	0	70	72	0	89	95	1	102	103	0	85	83	0	90	89	0	75	75	0
MCC	MCC11	A6 London Way / Brownedge Rd	B5257 Brownedge Road W	A6 London Way N	B - A	572::567to568::576	83	76	1	81	84	0	71	68	0	65	58	1	59	55	1	53	46	1	75	74	0	64	62	0	87	90	0	72	65	1	76	67	1	61	43	2
MCC	MCC11	A6 London Way / Brownedge Rd	B5257 Brownedge Road W	A6 London Way S	B - C	572::567to211::212	106	88	2	96	87	1	56	48	1	58	41	2	35	36	0	46	43	0	49	50	0	38	41	0	73	78	1	66	58	1	64	57	1	47	47	0
MCC	MCC11	A6 London Way / Brownedge Rd	B5257 Brownedge Road W	B5257 Brownedge Road E	B - D	572::567to570::573	109	110	0	200	216	1	132	104	3	106	63	5	92	84	1	128	111	2	132	123	1	139	128	1	194	184	1	184	115	6	158	111	4	109	118	1
MCC	MCC11	A6 London Way / Brownedge Rd	A6 London Way S	A6 London Way N	C - A	210::565to568::576	804	753	2	887	831	2	751	795	2	692	640	2	686	693	0	733	732	0	670	693	1	741	736	0	722	739	1	833	777	2	842	872	1	593	635	2
MCC	MCC11	A6 London Way / Brownedge Rd	A6 London Way S	B5257 Brownedge Road W	C - B	210::565to566::450	75	37	5	86	37	6	74	28	6	48	22	4	66	33	5	75	42	4	101	47	6	100	45	6	113	37	9	153	59	9	151	70	8	98	50	6
MCC	MCC11	A6 London Way / Brownedge Rd	A6 London Way S	B5257 Brownedge Road E	C - D	210::565to570::573	150	153	0	228	200	2	151	177	2	117	112	0	152	158	0	161	180	1	177	190	1	206	216	1	249	265	1	291	311	1	329	361	2	206	233	2
MCC	MCC11	A6 London Way / Brownedge Rd	B5257 Brownedge Road E	A6 London Way N	D - A	573::571to568::576	56	54	0	93	94	0	62	61	0	54	54	0	52	52	0	57	56	0	61	62	0	56	60	1	89	88	0	70	67	0	75	73	0	60	62	0
MCC	MCC11	A6 London Way / Brownedge Rd	B5257 Brownedge Road E	B5257 Brownedge Road W	D - B	573::571to566::450	106	51	6	179	160	1	122	85	4	134	49	9	135	54	8	126	49	8	79	52	3	69	59	1	87	64	3	178	156	2	172	174	0	112	98	1
MCC	MCC11	A6 London Way / Brownedge Rd	B5257 Brownedge Road E	A6 London Way S	D - C	573::571to211::212	235	239	0	270	273	0	165	175	1	133	133	0	143	147	0	152	154	0	89	147	5	79	184	9	231	242	1	211	219	1	205	209	0	134	140	1
								0			0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC12	B5254 Leyland Rd / Coote Lane	B5254 Leyland Road NW	Coote Lane SW	A - B	481::404to404::405	36	27	2	48	29	3	40	34	1	23	30	1	34	34	0	46	50	1	24	28	1	36	46	2	55	60	1	47	37	2	47	35	2	33	29	1
MCC	MCC12	B5254 Leyland Rd / Coote Lane	B5254 Leyland Road NW	B5254 Leyland Road SE	A - C	481::404to404::632	588	606	1	596	615	1	487	481	0	416	360	3	451	421	1	525	484	2	478	466	1	516	518	0	584	566	1	621	593	1	652	651	0	451	553	5
MCC	MCC12	B5254 Leyland Rd / Coote Lane	Coote Lane SW	B5254 Leyland Road NW	B - A	405::404to404::481	33	35	0	34	43	1	38	38	0	27	34	1	40	48	1	40	54	2	35	55	3	34	37	1	53	43	1	40	24	3	64	45	3	36	51	2
MCC	MCC12	B5254 Leyland Rd / Coote Lane	Coote Lane SW	B5254 Leyland Road SE	B - C	405::404to404::632	143	86	5	194	114	6	107	62	5	96	40	7	101	40	7	136	68	7	130	66	6	117	33	10	153	85	6	197	123	6	182	110	6	101	52	6
MCC	MCC12	B5254 Leyland Rd / Coote Lane	B5254 Leyland Road SE	B5254 Leyland Road NW	C - A	632::404to404::481	613	587	1	603	670	3	487	509	1	474	407	3	481	458	1	501	469	1	500	485	1	533	505	1	603	545	2	706	578	5	657	678	1	503	568	3
MCC	MCC12	B5254 Leyland Rd / Coote Lane	B5254 Leyland Road SE	Coote Lane SW	C - B	632::404to404::405	97	21	10	135	48	9	91	29	8	96	30	8	112	41	8	112	44	8	124	42	9	117	41	9	55	51	1	142	113	3	162	126	3	101	73	3
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC13	B5254 Leyland Rd / Brownedge Rd	B5254 Leyland Road NW	B5254 Watkin Lane SE	A - B	632::403to403::402	563	521	2	489	494	0	440	422	1	396	321	4	398	343	3	472	404	3	439	405	2	438	409	1	507	514	0	570	579	0	579	597	1	373	471	5
MCC	MCC13	B5254 Leyland Rd / Brownedge Rd	B5254 Leyland Road NW	B5257 Brownedge Road E	A - C	632::403to403::443	163	171	1	295	236	4	155	123	3	116	78	4	151	117	3	183	147	3	171	128	4	195	142	4	231	137	7	251	135	8	254	164	6	176	134	3
MCC	MCC13	B5254 Leyland Rd / Brownedge Rd	B5254 Watkin Lane SE	B5254 Leyland Road NW	B - A	402::403to403::632	587	492	4	568	534	1	436	402	2	444	330	6	447	359	4	457	363	5	471	381	4	498	406	4	483	433	2	681	559	5	639	642	0	479	506	1
MCC	MCC13	B5254 Leyland Rd / Brownedge Rd	B5254 Watkin Lane SE	B5257 Brownedge Road E	B - C	402::403to403::443	64	82	2	139	151	1	83	99	2	79	96	2	84	107	2	106	120	1	95	112	2	139	178	3	121	183	5	142	137	0	120	142	2	112	123	1
MCC	MCC13	B5254 Leyland Rd / Brownedge Rd	B5257 Brownedge Road E	B5254 Leyland Road NW	C - A	443::403to403::632	126	118	1	167	184	1	140	134	1	123	111	1	146	141	0	158	150	1	150	146	0	152	140	1	178	164	1	163	139	2	175	161	1	138	132	1
MCC	MCC13	B5254 Leyland Rd / Brownedge Rd	B5257 Brownedge Road E	B5254 Watkin Lane SE	C - B	443::403to403::402	77	102	3	117	137	2	124	135	1	104	114	1	115	123	1	110	120	1	112	118	1	99	101	0	155	142	1	125	156	3	131	146	1	87	105	2
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC14	B5254 Watkin Lane / Jubilee Rd	B5254 Watkin Lane NW	Jubilee Road SW	A - B	402::259to259::627	86	103	2	116	130	1	99	95	0	109	95	1	115	106	1	104	98	1	121	112	1	118	108	1	141	131	1	146	158	1	146	150	0	96	105	1
MCC	MCC14	B5254 Watkin Lane / Jubilee Rd	B5254 Watkin Lane NW	B5254 Watkin Lane SE	A - C	402::259to259::258	552	520	1	483	500	1	462	462	0	394	340	3	394	360	2	481	427	3	429	410	1	420	402	1	506	525	1	549	577	1	581	593	0	364	471	5
MCC	MCC14	B5254 Watkin Lane / Jubilee Rd	Jubilee Road SW	B5254 Watkin Lane NW	B - A	627::259to259::402	90	97	1	148	138	1	84	85	0	104	82	2	103	84	2	118	98	2	117	90	3	140	144	0	132	172	3	198	158	3	138	153	1	102	108	1
MCC	MCC14	B5254 Watkin Lane / Jubilee Rd	Jubilee Road SW	B5254 Watkin Lane SE	B - C	627::259to259::258	85	79	1	90	94	0	91	93	0	66	51	2	84	68	2	75	62	2	77	62	2	72	49	3	110	111	0	154	156	0	110	164	5	66	85	2
MCC	MCC14	B5254 Watkin Lane / Jubilee Rd	B5254 Watkin Lane SE	B5254 Watkin Lane NW	C - A	258::259to259::402	554	478	3	559	550	0	429	408	1	418	352	3	433	383	2	439	388	3	452	403	2	500	437	3	468	444	1	627	548	3	617	630	1	481	520	2
MCC	MCC14	B5254 Watkin Lane / Jubilee Rd	B5254 Watkin Lane SE	Jubilee Road SW	C - B	258::259to259::627	38	46	1	61	59	0	68	73	1	64	61	0	60	63	0	63	60	0	71	67	0	78	76	0	94	84	1	112	116	0	90	106	2	56	80	3
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC15	A6 / A582	A6 London Way N	A582 Lostock Lane W	A - B	216::101to98::197	240	233	0	302	284	1	215	249	2	211	201	1	232	239	0	270	273	0	256	249	0	280	271	1	334	328	0	337	358	1	330	351	1	208	203	0
MCC	MCC15	A6 / A582	A6 London Way N	M65 S	A - C	216::101to88::89	480	442	2	461	439	1	293	275	1	260	226	2	278	290	1	297	313	1	348	331	1	374	378	0	464	486	1	660	585	3	571	563	0	317	334	1
MCC	MCC15	A6 / A582	A6 London Way N	A6 Lostock Lane E	A - D	216::101to102::192	261	260	0	329	299	2	279	281	0	315	308	0	348	326	1	380	357	1	380	389	0	335	342	0	402	388	1	403	389	1	417	413	0	338	330	0
MCC	MCC15	A6 / A582	A582 Lostock Lane W	A6 London Way N	B - A	218::217to217::225	241	248	0	284	281	0	268	318	3	219	207	1	251	269	1	263	285	1	234	249	1	269	272	0	272	273	0	291	355	4	293	347	3	221	274	3
MCC	MCC15	A6 / A582	A582 Lostock Lane W	M65 S	B - C	217::99to88::89	1121	993	4	912	967	2	648	635	1	575	505	3	671	668	0	681	694	0	641	625	1	690	653	1	802	798	0	1010	823	6	989	913	2	540	590	2
MCC	MCC15	A6 / A582	A582 Lostock Lane W	A6 Lostock Lane E	B - D	217::99to102::192	466	427	2	515	492	1	547	546	0	482	403	4	463	417	2	551	464	4	506	488	1	499	437	3	520	467	2	501	412	4	513	470	2	385	397	1
MCC	MCC15	A6 / A582	M65 S	A6 London Way N	C - A	96::97to100::206	584	500	4	615	535	3	428	435	0	331	315	1	337	347	1	373	388	1	346	393	2	405	390	1	459	422	2	572	531	2	613	632	1	364	364	0
MCC	MCC15	A6 / A582	M65 S	A582 Lostock Lane W	C - B	87::104to104::193	1128	954	5	982	887	3	717	672	2	693	620	3	679	653	1	647	636	0	697	702	0	737	725	0	876	782	3	1086	971	4	1124	1123	0	652	641	0
MCC	MCC15	A6 / A582	M65 S	A6 Lostock Lane E	C - D	96::97to102::192	127	152	2	141	127	1	118	105	1	123	20	12	148	110	3	102	84	2	133	95	4	158	123	3	125	121	0	180	164	1	151	145	0	101	102	0
MCC	MCC15	A6 / A582	A6 Lostock Lane E	A6 London Way N	D - A	182::103to100::206	210	203	0	297	250	3	282	238	3	314	271	3	309	266	3	337	284	3	370	289	4	385	342	2	378	339	2	416	294	6	408	317	5	296	269	2
MCC	MCC15	A6 / A582	A6 Lostock Lane E	A582 Lostock Lane W	D - B	182::103to98::197	277	262	1	370	310	3	390	329	3	449	357	5	471	350	6	424	306	6	442	313	7	542	399	7	519	361	8	547	437	5	578	473	5	416	399	1
MCC	MCC15	A6 / A582	A6 Lostock Lane E	M65 S	D - C	182::103to88::89	83	113	3	85	92	1	82	89	1	91	70	2	107	95	1	106	73	3	95	74	2	117	114	0	110	138	3	120	118	0	135	124	1	83	76	1
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC16	M6 / A6 / Church Rd	M6 Preston Bypass NE	A6 Lostock Lane W	A - B	39::31to26::41	325	340	1	293	277	1	252	219	2	227	200	2	254	207	3	205	165	3	218	176	3	268	234	2	292	257	2	380	323	3	388	326	3	185	185	0
MCC	MCC16	M6 / A6 / Church Rd	M6 Preston Bypass NE	M6 Preston Bypass SW	A - C	39::31to34::37	83	50	4	89	84	1	72	97	3	56	78	3	60	88	3	66	101	4	59	99	5	91	105	1	135	131	0	175	194	1	160	219	4	68	74	1
MCC	MCC16	M6 / A6 / Church Rd	M6 Preston Bypass NE	Church Road SE	A - D	39::31to32::38	254	242	1	268	251	1	155	141	1	125	123	0	158	157	0	159	159	0	190	190	0	207	206	0	222	221	0	327	299	2	314	305	1	154	144	1
MCC	MCC16	M6 / A6 / Church Rd	A6 Lostock Lane W	M6 Preston Bypass NE	B - A	42::27to28::40	379	362	1	344	347	0	250	253	0	243	227	1	239	222	1	243	223	1	245	248	0	278	244	2	261	257	0	407	370	2	361	371	1	210	207	0
MCC	MCC16	M6 / A6 / Church Rd	A6 Lostock Lane W	M6 Preston Bypass SW	B - C	42::27to34::37	199	175	2	189	180	1	149	146	0	118	130	1	116	149	3	121	182	5	127	153	2	160	167	1	184	165	1	196	203	0	200	220	1	91	91	0
MCC	MCC16	M6 / A6 / Church Rd	A6 Lostock Lane W	Church Road SE	B - D	42::27to32::38	432	405	1	515	486	1	413	428	1	377	357	1	404	371	2	465	415	2	453	465	1	420	382	2	501	462	2	485	453	1	479	456	1	373	355	1
MCC	MCC16	M6 / A6 / Church Rd	M6 Preston Bypass SW	M6 Preston Bypass NE	C - A	24::25to28::40	154	126	2	125	119	1	81	72	1	97	75	2	88	66	3	57	58	0	45	45	0	74	62	1	55	48	1	84	67	2	73	79	1	43	52	1
MCC	MCC16	M6 / A6 / Church Rd	M6 Preston Bypass SW	A6 Lostock Lane W	C - B	19::24to24::132	143	86	5	157	133	2	83	84	0	81	71	1	80	101	2	72	79	1	107	112	0	97	106	1	99	117	2	118	99	2	127	110	2	80	66	2
MCC	MCC16	M6 / A6 / Church Rd	M6 Preston Bypass SW	Church Road SE	C - D	24::25to32::38	223	177	3	263	242	1	169	132	3	134	109	2	138	162	2	139	160	2	158	157	0	186	202	1	167	174	1	170	122	4	192	191	0	119	133	1
MCC	MCC16	M6 / A6 / Church Rd	Church Road SE	M6 Preston Bypass NE	D - A	38::33to28::40	318	293	1	295	295	0	211	198	1	167	164	0	170	169	0	137	138	0	221	218	0	222	222	0	174	176	0	268	257	1	280	270	1	123	121	0
MCC	MCC16	M6 / A6 / Church Rd	Church Road SE	A6 Lostock Lane W	D - B	38::33to26::41	341	377	2	492	509	1	451	377	4	422	382	2	435	362	4	449	349	5	467	377	4	506	447	3	465	398	3	492	407	4	530	434	4	348	336	1
MCC	MCC16	M6 / A6 / Church Rd	Church Road SE	M6 Preston Bypass SW	D - C	38::33to34::37	253	170	6	240	219	1	185	221	3	147	181	3	163	220	4	192	281	6	195	284	6	228	271	3	251	267	1	285	314	2	269	347	4	163	180	1
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC17	M6 / M65	M6 Preston Bypass NE	M65 W	A - B	20::9to3::17	144	90	5	162	182	2	138	225	6	98	182	7	104	252	11	134	317	12	119	258	10	178	294	8	205	282	5	263	334	4	254	432	10	126	156	3
MCC	MCC17	M6 / M65	M6 Preston Bypass NE	M6 Preston Bypass SW	A - C	20::9to14::23	222	171	4	201	167	3	163	140	2	141	120	2	136	114	2	154	140	1	162	168	0	179	148	2	211	174	3	239	214	2	239	225	1	132	123	1
MCC	MCC17	M6 / M65	M6 Preston Bypass NE	M65 E	A - D	37::20to20::21	166	131	3	151	136	1	109	97	1	95	81	1	100	91	1	89	104	2	108	111	0	118	100	2	142	108	3	162	152	1	137	134	0	67	68	0
MCC	MCC17	M6 / M65	M65 W	M6 Preston Bypass NE	B - A	18::5to6::19	181	92	8	180	80	9	117	61	6	119	70	5	96	72	3	103	73	3	81	137	5	121	77	4	92	67	3	119	85	3	126	124	0	64	62	0
MCC	MCC17	M6 / M65	M65 W	M6 Preston Bypass SW	B - C	18::5to14::23	331	345	1	355	392	2	258	274	1	186	163	2	232	222	1	235	219	1	292	261	2	244	234	1	344	350	0	444	402	2	424	431	0	208	251	3
MCC	MCC17	M6 / M65	M65 W	M65 E	B - D	18::5to10::21	0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	
MCC	MCC17	M6 / M65	M6 Preston Bypass SW	M6 Preston Bypass NE	C - A	1::2to6::19	234	178	4	243	280	2	140	141	0	123	120	0	147	144	0	107	128	2	131	101	3	161	167	0	141	147	1	145	112	3	179	160	1	123	119	0
MCC	MCC17	M6 / M65	M6 Preston Bypass SW	M65 W	C - B	62::1to1::43	467	525	3	475	402	3	339	324	1	257	247	1	275	257	1	243	221	1	298	292	0	269	250	1	314	297	1	359	388	2	396	440	2	232	247	1
MCC	MCC17	M6 / M65	M6 Preston Bypass SW	M65 E	C - D	1::2to10::21	986	985	0	823	828	0	616	619	0	558	550	0	541	542	0	557	559	0	577	575	0	600	600	0	643	642	0	935	915	1	884	890	0	523	530	0
MCC	MCC17	M6 / M65	M65 E	M6 Preston Bypass NE	D - A	22::13to6::19	116	120	0	106	133	2	78	80	0	69	71	0	63	111	5	60	94	4	94	79	2	83	123	4	82	124	4	107	96	1	100	96	0	60	66	1
MCC	MCC17	M6 / M65	M65 E	M65 W	D - B	22::13to3::17	0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	
MCC	MCC17	M6 / M65	M65 E	M6 Preston Bypass SW	D - C	65::22to22::23	934	933	0	900	902	0	657	662	0	593	582	0	529	530	0	557	557	0	610	607	0	670	670	0	747	747	0	1023	1004	1	932	934	0	511	520	0
								0			0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC18A	A582 / Croston Rd / Centurian Way	Croston Road N	A582 SW	A - B	283::280to277::284	109	91	2	129	115	1	106	90	2	86	61	3	86	74	1	73	64	1	97	74	2	94	81	1	145	86	5	121	106	1	119	106	1	65	59	1
MCC	MCC18A	A582 / Croston Rd / Centurian Way	Croston Road N	Centurion Way SE	A - C	283::280to275::282	42	34	1	54	29	4	22	15	2	17	17	0	24	23	0	24	24	0	23	24	0	25	28	1	28	21	1	38	19	4	31	32	0	20	20	0
MCC	MCC18A	A582 / Croston Rd / Centurian Way	Croston Road N	A582 Farington Road E	A - D	283::280to281::273	59	32	4	51	18	6	35	13	4	38	46	1	31	44	2	37	52	2	41	56	2	35	48	2	37	31	1	65	78	2	46	42	1	40	17	4
MCC	MCC18A	A582 / Croston Rd / Centurian Way	A582 SW	Croston Road N	B - A	621::278to279::283	97	102	1	165	128	3	71	69	0	77	78	0	84	85	0	88	79	1	114	112	0	103	104	0	139	165	2	198	173	2	127	124	0	72	92	2
MCC	MCC18A	A582 / Croston Rd / Centurian Way	A582 SW	Centurion Way SE	B - C	621::278to275::282	156	150	0	156	162	0	86	77	1	89	90	0	87	90	0	78	85	1	81	84	0	102	102	0	95	108	1	131	108	2	89	78	1	62	57	1
MCC	MCC18A	A582 / Croston Rd / Centurian Way	A582 SW	A582 Farington Road E	B - D	621::278to281::273	877	807	2	887	862	1	787	862	3	671	635	1	625	681	2	716	756	1	717	750	1	759	799	1	838	871	1	849	822	1	833	925	3	584	614	1
MCC	MCC18A	A582 / Croston Rd / Centurian Way	Centurion Way SE	Croston Road N	C - A	282::276to279::283	18	3	5	22	5	5	19	6	4	26	7	5	22	8	4	32	7	6	18	7	3	24	8	4	35	7	6	111	82	3	52	69	2	18	37	4
MCC	MCC18A	A582 / Croston Rd / Centurian Way	Centurion Way SE	A582 SW	C - B	282::276to277::284	90	72	2	87	90	0	57	46	2	91	73	2	75	74	0	76	72	0	45	40	1	94	90	0	121	125	0	271	173	7	152	146	0	62	120	6
MCC	MCC18A	A582 / Croston Rd / Centurian Way	Centurion Way SE	A582 Farington Road E	C - D	282::276to281::273	42	9	7	29	23	1	14	13	0	100	92	1	198	178	1	158	140	1	45	48	0	110	105	0	102	109	1	130	88	4	101	88	1	41	85	6
MCC	MCC18A	A582 / Croston Rd / Centurian Way	A582 Farington Road E	Croston Road N	D - A	273::274to279::283	61	45	2	74	62	1	41	7	7	39	37	0	41	37	1	45	44	0	66	64	0	51	50	0	77	49	4	94	58	4	94	61	4	40	11	6
MCC	MCC18A	A582 / Croston Rd / Centurian Way	A582 Farington Road E	A582 SW	D - B	273::274to277::284	790	823	1	848	851	0	645	741	4	636	590	2	701	702	0	671	684	0	717	706	0	793	781	0	839	874	1	946	915	1	1049	1063	0	605	643	2
MCC	MCC18A	A582 / Croston Rd / Centurian Way	A582 Farington Road E	Centurion Way SE	D - C	273::274to275::282	129	84	4	43	46	0	80	78	0	125	121	0	101	104	0	70	76	1	46	49	0	94	90	0	58	59	0	55	20	6	58	43	2	35	34	0
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	A582 NE	A582 Flensburg Way NW	A - B	620::285to290::295	761	763	0	818	814	0	622	677	2	661	582	3	685	662	1	609	615	0	650	621	1	750	714	1	754	723	1	945	840	4	968	955	0	560	607	2
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	A582 NE	Croston Road SW	A - C	620::285to288::294	223	220	0	244	241	0	188	201	1	153	136	1	178	163	1	212	199	1	208	197	1	231	215	1	351	353	0	392	343	3	349	360	1	172	214	3
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	A582 NE	Fidler Lane SE	A - D	620::285to286::296	2	1	1	1	0	1	1	0	1	1	1	0	1	20	6	1	2	1	2	2	0	0	18		1	5	2	4	4	0	1	0	1	3	1	1
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	A582 Flensburg Way NW	A582 NE	B - A	295::291to292::293	723	669	2	779	756	1	718	777	2	684	662	1	661	715	2	686	732	2	726	739	0	768	771	0	834	832	0	830	756	3	835	910	3	576	567	0
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	A582 Flensburg Way NW	Croston Road SW	B - C	295::291to288::294	64	52	2	90	74	2	64	69	1	57	44	2	36	33	1	59	56	0	51	45	1	59	51	1	194	166	2	164	121	4	48	61	2	40	46	1
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	A582 Flensburg Way NW	Fidler Lane SE	B - D	295::291to286::296	1	7	3	1	4	2	1	3	1	2	26	6	0	29		2	31	7	1	32	8	1	14	5	1	19	6	0	12		1	3	1	0	12	
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	Croston Road SW	A582 NE	C - A	294::289to292::293	403	388	1	424	392	2	227	229	0	151	135	1	139	132	1	194	181	1	185	171	1	195	189	0	241	248	0	346	349	0	212	213	0	141	170	2
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	Croston Road SW	A582 Flensburg Way NW	C - B	294::289to290::295	77	86	1	93	65	3	52	42	1	43	26	3	49	37	2	43	29	2	50	32	3	73	52	3	68	58	1	60	53	1	48	42	1	27	21	1
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	Croston Road SW	Fidler Lane SE	C - D	294::289to286::296	0	3		0	2		1	1	0	0	2		1	2	1	0	2		2	3	1	2	3	1	1	2	1	0	3		1	2	1	0	2	
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	Fidler Lane SE	A582 NE	D - A	296::287to292::293	2	3	1	3	2	1	2	1	1	2	3	1	1	6	3	2	2	0	0	37		0	43		0	61		3	2	1	2	4	1	0	16	
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	Fidler Lane SE	A582 Flensburg Way NW	D - B	296::287to290::295	0	6		3	6	1	1	3	1	2	41	8	0	52		2	30	7	3	24	6	2	28	7	0	51		1	5	2	1	4	2	1	3	1
MCC	MCC18B	A582 / Croston Rd / Fidler Lane	Fidler Lane SE	Croston Road SW	D - C	296::287to288::294	1	5	2	2	3	1	0	2		0	2		0	2		0	2		0	2		0	2		1	2	1	1	2	1	1	2	1	0	2	
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC19	A582 Penwortham Way / Flensburg Way	A582 Penwortham Way N	B5253 Flensburg Way S	A - C	360::350to344::352	325	295	2	306	281	1	306	291	1	264	212	3	271	244	2	321	295	1	298	284	1	302	260	3	286	274	1	324	269	3	435	393	2	267	278	1
MCC	MCC19	A582 Penwortham Way / Flensburg Way	A582 Penwortham Way N	Moss Lane SE	A - D	360::350to353::354	0	5		2	2	0	0	10		4	4	0	1	0	1	2	1	1	0	17		2	2	0	1	3	1	0	9		0	17		1	3	1
MCC	MCC19	A582 Penwortham Way / Flensburg Way	A582 Penwortham Way N	A582 Flensburg Way NE	A - E	360::350to351::359	536	520	1	626	627	0	495	579	4	444	471	1	414	487	3	429	533	5	459	536	3	534	527	0	701	660	2	667	666	0	498	602	4	364	391	1
MCC	MCC19	A582 Penwortham Way / Flensburg Way	B5253 Flensburg Way S	A582 Penwortham Way N	C - A	357::346to349::358	328	214	7	298	250	3	283	278	0	237	166	5	258	213	3	271	240	2	268	221	3	278	215	4	258	190	5	347	330	1	351	322	2	257	203	4
MCC	MCC19	A582 Penwortham Way / Flensburg Way	B5253 Flensburg Way S	Moss Lane SE	C - D	357::346to353::354	5	8	1	3	4	1	1	4	2	4	5	0	2	3	1	3	6	1	0	4		1	2	1	1	2	1	1	4	2	1	2	1	0	4	
MCC	MCC19	A582 Penwortham Way / Flensburg Way	B5253 Flensburg Way S	A582 Flensburg Way NE	C - E	357::346to351::359	219	180	3	250	187	4	259	228	2	281	250	2	270	262	0	290	258	2	271	249	1	276	281	0	252	278	2	253	235	1	370	334	2	232	200	2
MCC	MCC19	A582 Penwortham Way / Flensburg Way	A582 Flensburg Way NE	A582 Penwortham Way N	E - A	342::343to349::358	544	612	3	653	673	1	415	517	5	405	441	2	418	506	4	388	468	4	383	476	4	496	562	3	510	558	2	664	654	0	645	651	0	388	429	2
MCC	MCC19	A582 Penwortham Way / Flensburg Way	A582 Flensburg Way NE	B5253 Flensburg Way S	E - C	342::343to344::352	267	236	2	263	214	3	193	206	1	214	193	1	247	238	1	206	203	0	213	192	1	241	226	1	236	259	1	266	222	3	361	323	2	217	191	2
MCC	MCC19	A582 Penwortham Way / Flensburg Way	A582 Flensburg Way NE	Moss Lane SE	E - D	342::343to353::354	17	7	3	2	2	0	5	2	2	4	3	1	6	4	1	7	6	0	10	9	0	4	4	0	1	15	5	3	1	1	0	31		0	20	
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC20	A582 Penwortham Way / Chain House Lane	A582 Penwortham Way N	Chain House Lane W	A - B	376::375to375::389	7	0	4	23	0	7	13	0	5	13	0	5	21	0	6	29	0	8	18	0	6	20	0	6	19	0	6	18	0	6	11	0	5	13	0	5
MCC	MCC20	A582 Penwortham Way / Chain House Lane	A582 Penwortham Way N	A582 Penwortham Way S	A - C	376::375to375::374	674	630	2	703	692	0	576	687	4	503	490	1	500	561	3	530	605	3	550	602	2	630	573	2	731	680	2	698	712	1	739	753	1	483	521	2
MCC	MCC20	A582 Penwortham Way / Chain House Lane	A582 Penwortham Way N	Chain House Lane E	A - D	376::1318to1318::386	56	14	7	129	38	10	61	32	4	62	21	6	61	24	6	66	34	5	78	30	7	74	24	7	131	70	6	125	24	12	121	40	9	63	23	6
MCC	MCC20	A582 Penwortham Way / Chain House Lane	Chain House Lane W	A582 Penwortham Way N	B - A	389::375to375::376	18	2	5	18	73	8	18	12	2	18	2	5	20	3	5	25	3	6	36	3	7	34	4	7	32	31	0	24	66	6	32	99	8	19	37	3
MCC	MCC20	A582 Penwortham Way / Chain House Lane	Chain House Lane W	A582 Penwortham Way S	B - C	389::375to375::374	219	200	1	207	193	1	166	177	1	171	192	2	134	166	3	167	206	3	176	207	2	156	209	4	212	234	1	249	255	0	195	226	2	131	141	1
MCC	MCC20	A582 Penwortham Way / Chain House Lane	Chain House Lane W	Chain House Lane E	B - D	389::375to375::386	133	105	3	154	97	5	101	95	1	90	30	8	92	58	4	112	57	6	107	75	3	103	52	6	158	95	6	251	195	4	189	188	0	97	94	0
MCC	MCC20	A582 Penwortham Way / Chain House Lane	A582 Penwortham Way S	A582 Penwortham Way N	C - A	374::375to375::376	585	533	2	706	668	1	517	600	4	465	417	2	525	518	0	464	469	0	477	461	1	558	493	3	530	486	2	693	654	2	715	695	1	466	481	1
MCC	MCC20	A582 Penwortham Way / Chain House Lane	A582 Penwortham Way S	Chain House Lane W	C - B	374::1317to1317::389	251	280	2	262	254	0	203	189	1	196	163	2	182	214	2	207	249	3	195	230	2	246	287	3	250	286	2	325	288	2	281	251	2	181	166	1
MCC	MCC20	A582 Penwortham Way / Chain House Lane	A582 Penwortham Way S	Chain House Lane E	C - D	374::375to375::386	5	8	1	8	19	3	13	11	1	14	19	1	9	14	1	18	26	2	17	25	2	12	12	0	18	18	0	15	16	0	9	18	2	16	18	0
MCC	MCC20	A582 Penwortham Way / Chain House Lane	Chain House Lane E	A582 Penwortham Way N	D - A	386::375to375::376	85	26	8	124	74	5	68	45	3	35	25	2	37	30	1	56	41	2	61	35	4	68	42	4	87	58	3	96	62	4	82	46	5	66	20	7
MCC	MCC20	A582 Penwortham Way / Chain House Lane	Chain House Lane E	Chain House Lane W	D - B	386::375to375::389	166	54	11	172	161	1	115	113	0	94	33	8	115	45	8	122	46	8	139	52	9	119	43	8	145	48	10	170	159	1	188	182	0	83	96	1
MCC	MCC20	A582 Penwortham Way / Chain House Lane	Chain House Lane E	A582 Penwortham Way S	D - C	386::375to375::374	8	5	1	17	16	0	17	14	1	14	16	1	12	13	0	17	17	0	20	25	1	13	15	1	17	19	0	21	12	2	16	14	1	8	7	0
								0			0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC21	A6 / Carwood Rd	A6 London Way N	Carwood Road SW	A - B	619::602to599::510	69	74	1	97	109	1	118	112	1	138	132	1	131	130	0	171	174	0	159	160	0	177	190	1	193	196	0	271	256	1	285	288	0	197	205	1
MCC	MCC21	A6 / Carwood Rd	A6 London Way N	A6 London Way SE	A - C	619::602to605::606	409	386	1	516	491	1	503	486	1	560	544	1	643	647	0	706	711	0	749	747	0	779	777	0	856	844	0	1077	1054	1	1011	996	0	650	647	0

MCC	MCC21	A6 / Carwood Rd	A6 London Way N	Hennel Lane E	A - D	619::602to603::608	13	13	0	21	21	0	31	31	0	27	1	7	42	42	0	52	53	0	47	48	0	44	45	0	47	48	0	47	46	0	62	62	0	55	48	1
MCC	MCC21	A6 / Carwood Rd	Carwood Road SW	A6 London Way N	B - A	510::600to601::612	200	204	0	234	253	1	152	161	1	151	146	0	156	153	0	153	154	0	161	163	0	126	123	0	160	149	1	177	145	3	166	172	0	137	164	2
MCC	MCC21	A6 / Carwood Rd	Carwood Road SW	A6 London Way SE	B - C	510::600to605::606	167	154	1	172	150	2	90	92	0	80	74	1	79	80	0	97	91	1	85	83	0	87	82	1	119	116	0	126	115	1	124	122	0	65	62	0
MCC	MCC21	A6 / Carwood Rd	Carwood Road SW	Hennel Lane E	B - D	510::600to603::608	101	104	0	185	192	1	74	82	1	81	77	0	62	54	1	92	88	0	95	93	0	143	139	0	175	171	0	155	126	2	208	164	3	113	133	2
MCC	MCC21	A6 / Carwood Rd	A6 London Way SE	A6 London Way N	C - A	597::598to601::612	759	724	1	877	844	1	726	743	1	662	602	2	621	625	0	634	646	0	634	632	0	664	658	0	629	657	1	632	595	1	632	659	1	489	502	1
MCC	MCC21	A6 / Carwood Rd	A6 London Way SE	Carwood Road SW	C - B	597::598to599::510	91	84	1	107	96	1	82	87	1	71	61	1	104	99	0	98	101	0	99	102	0	122	112	1	149	143	0	212	167	3	233	207	2	134	131	0
MCC	MCC21	A6 / Carwood Rd	A6 London Way SE	Hennel Lane E	C - D	597::598to603::608	88	74	2	78	70	1	88	95	1	83	72	1	72	74	0	84	89	1	91	92	0	86	89	0	111	115	0	133	126	1	134	151	1	100	112	1
MCC	MCC21	A6 / Carwood Rd	Hennel Lane E	A6 London Way N	D - A	608::604to601::612	27	27	0	47	47	0	44	27	3	46	5	8	55	55	0	68	68	0	44	45	0	38	39	0	47	48	0	53	54	0	62	66	1	44	48	1
MCC	MCC21	A6 / Carwood Rd	Hennel Lane E	Carwood Road SW	D - B	608::604to599::510	124	138	1	190	158	2	97	118	2	78	80	0	98	100	0	93	98	1	93	95	0	101	108	1	193	195	0	153	154	0	196	203	0	153	163	1
MCC	MCC21	A6 / Carwood Rd	Hennel Lane E	A6 London Way SE	D - C	608::604to605::606	133	123	1	167	159	1	101	103	0	83	86	0	81	81	0	101	102	0	101	96	1	91	86	1	123	114	1	114	114	0	107	101	1	84	80	0
								0			0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC23	Cop Lane / Hill Rd S	Hill Road South NE	Cop Lane NW	A - B	860::812to812::811	40	40	0	80	85	1	44	55	2	51	53	0	32	35	1	44	47	0	40	40	0	64	68	0	66	69	0	43	46	0	48	58	1	59	53	1
MCC	MCC23	Cop Lane / Hill Rd S	Hill Road South NE	Cop Lane SE	A - D	860::812to812::1007	28	29	0	42	29	2	31	27	1	17	18	0	34	35	0	36	33	1	30	28	0	26	26	0	52	50	0	36	29	1	36	34	0	29	28	0
MCC	MCC23	Cop Lane / Hill Rd S	Cop Lane NW	Hill Road South NE	B - A	811::812to812::860	15	17	1	64	60	1	45	46	0	39	37	0	44	49	1	73	74	0	48	49	0	61	63	0	82	90	1	72	65	1	68	86	2	65	75	1
MCC	MCC23	Cop Lane / Hill Rd S	Cop Lane NW	Cop Lane SE	B - D	811::812to812::1007	145	116	3	288	327	2	207	210	0	183	160	2	237	209	2	289	265	1	261	266	0	266	237	2	410	350	3	331	228	6	333	296	2	285	272	1
MCC	MCC23	Cop Lane / Hill Rd S	Cop Lane SE	Hill Road South NE	D - A	1007::812to812::860	8	10	1	29	28	0	33	38	1	24	24	0	24	26	0	20	23	1	38	36	0	25	28	1	41	43	0	55	48	1	47	52	1	37	42	1
MCC	MCC23	Cop Lane / Hill Rd S	Cop Lane SE	Cop Lane NW	D - B	1007::812to812::811	224	195	2	434	424	0	260	259	0	240	240	0	280	257	1	304	300	0	265	273	0	278	275	0	369	378	0	321	305	1	368	397	1	268	284	1
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC24	Cop Lane / Pope Lane	Pope Lane E	Cop Lane NW	A - B	849::847to847::1007	128	123	0	327	317	1	171	175	0	165	163	0	190	191	0	213	217	0	169	173	0	197	196	0	283	286	0	251	242	1	261	304	3	202	229	2
MCC	MCC24	Cop Lane / Pope Lane	Pope Lane E	Pope Lane SW	A - C	849::847to847::846	94	94	0	166	184	1	105	133	3	100	108	1	93	104	1	115	121	1	140	147	1	135	130	0	139	123	1	156	157	0	124	157	3	106	150	4
MCC	MCC24	Cop Lane / Pope Lane	Cop Lane NW	Pope Lane E	B - A	1007::847to847::849	97	91	1	221	245	2	157	152	0	132	98	3	164	120	4	213	174	3	178	165	1	170	136	3	301	235	4	242	162	6	252	214	2	212	200	1
MCC	MCC24	Cop Lane / Pope Lane	Cop Lane NW	Pope Lane SW	B - C	1007::847to847::846	75	60	2	111	123	1	85	91	1	68	81	2	107	125	2	104	125	2	111	130	2	113	129	1	153	165	1	107	94	1	121	116	0	85	100	2
MCC	MCC24	Cop Lane / Pope Lane	Pope Lane SW	Pope Lane E	C - A	846::847to847::849	62	84	3	103	165	5	87	131	4	81	82	0	75	78	0	86	88	0	84	101	2	96	112	2	120	130	1	134	130	0	121	148	2	87	127	4
MCC	MCC24	Cop Lane / Pope Lane	Pope Lane SW	Cop Lane NW	C - B	846::847to847::1007	84	83	0	118	135	2	113	122	1	96	104	1	104	97	1	101	108	1	126	139	1	106	111	0	137	138	0	126	121	0	152	153	0	101	103	0
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC25	A582 / B5254 / Stanifield Lane	B5254 Watkin Lane NW	A582 Farington Road W	A - B	230::236to233::240	33	45	2	30	59	4	26	46	3	30	47	3	26	49	4	37	55	3	29	50	3	21	47	4	26	34	1	34	42	1	31	54	4	8	30	5
MCC	MCC25	A582 / B5254 / Stanifield Lane	B5254 Watkin Lane NW	A5083 Stanfield Lane S	A - C	230::236to260::237	141	136	0	175	168	1	151	148	0	141	117	2	131	114	2	157	130	2	145	136	1	157	136	2	177	170	1	180	144	3	201	193	1	134	154	2
MCC	MCC25	A582 / B5254 / Stanifield Lane	B5254 Watkin Lane NW	A582 Lostock Lane E	A - D	230::236to219::220	546	506	2	458	485	1	387	421	2	323	270	3	323	304	1	406	373	2	352	366	1	341	342	0	390	465	4	501	481	1	491	490	0	296	380	5
MCC	MCC25	A582 / B5254 / Stanifield Lane	A582 Farington Road W	B5254 Watkin Lane NW	B - A	241::242to242::243	10	29	4	25	50	4	18	44	5	24	35	2	17	40	4	32	41	1	17	40	4	27	47	3	22	56	5	23	48	4	32	53	3	17	49	6
MCC	MCC25	A582 / B5254 / Stanifield Lane	A582 Farington Road W	A5083 Stanfield Lane S	B - C	242::234to260::237	40	37	0	78	67	1	78	83	1	69	67	0	57	71	2	83	91	1	76	80	0	76	80	0	89	94	1	91	104	1	77	87	1	58	59	0
MCC	MCC25	A582 / B5254 / Stanifield Lane	A582 Farington Road W	A582 Lostock Lane E	B - D	242::234to219::220	902	734	6	912	819	3	784	780	0	743	651	3	761	777	1	843	817	1	732	745	0	811	788	1	862	829	1	945	814	4	959	914	1	597	620	1
MCC	MCC25	A582 / B5254 / Stanifield Lane	A5083 Stanfield Lane S	B5254 Watkin Lane NW	C - A	239::232to235::244	112	115	0	145	143	0	137	127	1	128	118	1	139	149	1	153	161	1	157	167	1	162	174	1	193	252	4	189	176	1	168	178	1	139	155	1
MCC	MCC25	A582 / B5254 / Stanifield Lane	A5083 Stanfield Lane S	A582 Farington Road W	C - B	239::232to233::240	46	69	3	81	91	1	72	73	0	73	67	1	76	73	0	75	67	1	71	64	1	72	67	1	67	40	4	64	80	2	56	76	2	34	36	0
MCC	MCC25	A582 / B5254 / Stanifield Lane	A5083 Stanfield Lane S	A582 Lostock Lane E	C - D	239::232to219::220	302	292	1	267	273	0	254	234	1	187	186	0	260	262	0	237	242	0	235	233	0	245	247	0	235	179	4	308	287	1	279	295	1	214	244	2
MCC	MCC25	A582 / B5254 / Stanifield Lane	A582 Lostock Lane E	B5254 Watkin Lane NW	D - A	204::205to235::244	467	344	6	433	364	3	356	306	3	339	242	6	353	266	5	344	260	5	347	258	5	390	282	6	490	253	12	553	450	5	566	491	3	391	358	2
MCC	MCC25	A582 / B5254 / Stanifield Lane	A582 Lostock Lane E	A582 Farington Road W	D - B	204::205to233::240	931	867	2	892	776	4	673	702	1	738	654	3	726	723	0	712	678	1	728	707	1	864	814	2	893	904	0	1058	915	5	1059	1020	1	641	606	1
MCC	MCC25	A582 / B5254 / Stanifield Lane	A582 Lostock Lane E	A5083 Stanfield Lane S	D - C	204::1319to1319::237	236	235	0	315	293	1	241	250	1	243	246	0	274	273	0	262	269	0	248	266	1	276	272	0	262	295	2	297	298	0	342	321	1	223	222	0
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC26	A6 / B6258 / Wigan Rd	B6258 Station Road NE	A6 Lostock Lane W	A - B	157::140to140::172	102	133	3	120	168	4	132	148	1	170	184	1	146	207	5	131	191	5	148	163	1	179	207	2	158	199	3	145	164	2	157	185	2	141	163	2
MCC	MCC26	A6 / B6258 / Wigan Rd	B6258 Station Road NE	A49 Wigan Road SW	A - C	157::140to140::149	95	90	1	124	121	0	93	89	0	110	52	6	104	102	0	108	109	0	115	114	0	140	124	1	139	143	0	131	127	0	143	138	0	103	105	0
MCC	MCC26	A6 / B6258 / Wigan Rd	B6258 Station Road NE	A6 Lostock Lane SE	A - D	159::158to158::164	358	364	0	344	360	1	263	278	1	215	226	1	226	238	1	249	266	1	237	255	1	267	258	1	322	328	0	383	382	0	350	361	1	200	211	1
MCC	MCC26	A6 / B6258 / Wigan Rd	A6 Lostock Lane W	B6258 Station Road NE	B - A	165::140to140::157	83	86	0	159	156	0	142	147	0	175	168	1	192	190	0	205	201	0	184	207	2	231	226	0	198	201	0	201	177	2	208	207	0	180	184	0
MCC	MCC26	A6 / B6258 / Wigan Rd	A6 Lostock Lane W	A49 Wigan Road SW	B - C	172::140to140::149	73	64	1	88	83	1	104	101	0	118	90	3	147	119	2	176	134	3	156	132	2	179	143	3	158	128	3	199	163	3	211	241	2	157	148	1
MCC	MCC26	A6 / B6258 / Wigan Rd	A6 Lostock Lane W	A6 Lostock Lane SE	B - D	165::140to140::141	506	469	2	555	497	3	447	462	1	448	430	1	480	444	2	509	484	1	522	552	1	505	456	2	552	480	3	574	553	1	579	570	0	422	369	3
MCC	MCC26	A6 / B6258 / Wigan Rd	A49 Wigan Road SW	B6258 Station Road NE	C - A	149::140to140::157	89	85	0	110	107	0	89	88	0	76	68	1	71	68	0	95	92	0	98	94	0	138	124	1	123	124	0	155	142	1	121	134	1	97	99	0
MCC	MCC26	A6 / B6258 / Wigan Rd	A49 Wigan Road SW	A6 Lostock Lane W	C - B	149::140to140::172	12	12	0	32	27	1	27	24	1	38	34	1	32	36	1	43	46	0	31	30	0	40	39	0	38	40	0	38	42	1	30	34	1	17	23	1
MCC	MCC26	A6 / B6258 / Wigan Rd	A49 Wigan Road SW	A6 Lostock Lane SE	C - D	149::140to140::141	133	120	1	155	140	1	84	80	0	73	73	0	54	55	0	62	63	0	72	74	0	79	76	0	66	69	0	140	116	2	106	107	0	55	59	1
MCC	MCC26	A6 / B6258 / Wigan Rd	A6 Lostock Lane SE	B6258 Station Road NE	D - A	148::140to140::157	288	304	1	336	354	1	236	243	0	227	237	1	231	276	3	223	264	3	287	295	0	267	320	3	252	293	2	309	314	0	353	379	1	202	206	0
MCC	MCC26	A6 / B6258 / Wigan Rd	A6 Lostock Lane SE	A6 Lostock Lane W	D - B	139::140to140::172	425	411	1	500	466	2	464	363	5	454	364	4	482	326	8	440	259	10	452	322	7	519	384	6	490	364	6	544	378	8	559	371	9	368	336	2
MCC	MCC26	A6 / B6258 / Wigan Rd	A6 Lostock Lane SE	A49 Wigan Road SW	D - C	139::140to140::149	84	87	0	97	96	0	83	77	1	41	36	1	68	72	0	72	64	1	59	49	1	81	86	1	99	109	1	124	114	1	128	123	0	54	52	0
											0			0			0			0			0			0			0			0			0			0			0	
MCC	MCC27	A6 Lostock Lane			Eastbound	169::166	659	618	2	810	737	3	684	723	1	741	689	2	812	754	2	882	833	2	864	876	0	913	825	3	904	814	3	973	900	2	1005	1018	0	754	700	2
MCC	MCC27	A6 Lostock Lane			Westbound	172::171	534	564	1	651	656	0	637	537	4	655	580	3	657	569	4	609	495	5	631	515	5	733	633	4	688	601	3	737	578	6	749	594	6	531	522	0
ATC	ATC1	A59 Liverpool Road			Eastbound	927::928	209	202	0	500	476	1	276	309	2	271	225	3	260	263	0	292	239	3	284	214	4	321	302	1	411	338	4	346	323	1	374	345	2	273	276	0
ATC	ATC1	A59 Liverpool Road			Westbound	928::927	206	207	0	494	462	1	276	255	1	295	269	2	323	305	1	352	329	1	327	317	1	364	361	0	506	382	6	413	397	1	424	471	2	327	343	1
ATC	ATC2	Cop Lane			Northbound	883::884	107	88	2	305	235	4	198	148	4	194	123	6	204	142	5	219	167	4	200	152	4	240	181	4	277	207	4	263	169	6	286	221	4	211	151	4
ATC	ATC2	Cop Lane			Southbound	884::883	112	104	1	292	281	1	199	196	0	202	137	5	202	140	5	227	192	2	208	202	0	226	164	4	332	366	2	246	160	6	247	219	2	188	155	2
ATC	ATC4	B5254 Leyland Road			Northbound	657::658	849	835	0	874	953	3	644	668	1	530	472	3	492	528	2	530	545	1	508	548	2	525	556	1	581	598	1	637	567	3	641	678	1	476	622	6
ATC	ATC4	B5254 Leyland Road			Southbound	658::657	455	466	1	545	530	1	445	468	1	428	416	1	499	461	2	551	556	0	565	535	1	614	630	1	732	723	0	835	831	0	912	833	3	544	687	6
ATC	ATC5	John Horrocks Way			Eastbound	892::804	796	781	1	886	918	1	613	661	2	534	495	2	478	457	1	523	496	1	462	490	1	510	480	1	653	634	1	649	662	1	626	675	2	489	518	1
ATC	ATC5	John Horrocks Way			Westbound	802::888	650	535	5	862	720	5	478	511	1	433	375	3	473	409	3	495	487	0	519	491	1	593	534	2	635	665	1	785	702	3	830	829	0	500	544	2
ATC	ATC6	B5254 Leyland Road			Northbound	559::560	735	786	2	928	962	1	641	644	0	579	509	3	585	592	0	619	606	1	619	627	0	714	669	2	821	722	4	894	726	6	928	899	1	647	736	3
ATC	ATC6	B5254 Leyland Road			Southbound	560::559	600	656	2	716	685	1	543	578	1	504	443	3	531	490	2	600	584	1	614	593	1	659	627	1	779	801	1	883	756	4	888	831	2	569	644	3
ATC	ATC7	Coote Lane			Eastbound	418::625	134	119	1	181	139	3	117	127	1	102	56	5	119	81	4	114	104	1	118	113	0	133	71	6	194	148	3	217	204	1	193	209	1	130	121	1
ATC	ATC7	Coote Lane			Westbound	625::418	130	75	5	175	228	4	115	155	3	109	58	6	112	71	4	110	79	3	121	86	3	128	78	5	163	90	6	157	193	3	162	228	5	97	108	1
ATC	ATC9	A582 Farington Way			Eastbound	272::271	1005	843	5	981	908	2	846	888	1	837	767	2	906	900	0	876	951	2	822	853	1	943	949	0	936	1007	2	1045	981	2	919	1053	4	657	721	2
ATC	ATC9	A582 Farington Way			Westbound	271::272	986	954	1	998	956	1	828	823	0	849	749	4	840	843	0	821	806	1	834	817	1	945	924	1	1046	980	2	1159	998	5	1235	1165	2	739	687	2
ATC	ATC10	B5254 Watkin Lane			Northbound	252::253	575	484	4	603	575	1	522	467	2	482	411	3	487	450	2	487	460	1	495	469	1	579	518	3	643	502	6	738	647	3	700	709	0	496	559	3
ATC	ATC10	B5254 Watkin Lane			Southbound	253::252	652	616	1	641	637	0	560	574	1	467	415	2	500	457	2	526	525	0	552	519	1	538	503	2	656	667	0	697	672	1	674	688	1	455	546	4
ATC	ATC11	A6 Lostock Lane			Eastbound	168::169	599	618	1	663	737	3	611	723	4	626	690	2	677	754	3	701	833	5	687	876	7	730	825	3	778	814	1	780	901	4	749	1018	9	554	700	6
ATC	ATC11	A6 Lostock Lane			Westbound	171::173	590	580	0	704	714	0	685	582	4	704	625	3	700	649	2	668	570	4	692	576	5	775	723	2	744	699	2	784	635	6	773	658	4	593	567	1
																	0			0			0			0			0			0			0			0			0	
WEBTRIS	M65/4011B	M65 EB			Eastbound	82::81	1280	1096	5	1228	1045	5	809	669	5	828	552	11	791	753	1	758	787	1	783	634	6	883	826	2	1005	1005	0	1254	999	8	1253	1051	6	764	707	2
WEBTRIS	M65/4011A	M65 WB			Westbound	69::70	1221	996	7	989	960	1	707	643	2	654	549	4	748	607	5	799	572	9	738	644	4	853	692	6	968	747	8	1252	981	8	1179	1028	5	694	683	0
WEBTRIS	M6/7438A	M6 (north of M65)			Northbound	47::48	2885	2848	1	2337	2384	1	1957	2130	4	1763	2004	6	1672	1987	7	1607	1911	7	1716	2026	7	1774	1987	5	1839	1931	2	2110	2304	4	1998	1939	1	1468	1479	0
WEBTRIS	M6/7442B	M6 (north of M65)			Southbound	56::57	1838	1900	1	1817	1802	0	1617	1633	0	1430	1535	3	1553	1607	1	1669	1916	6	1688	1928	6	2054	2333	6	2374	2351	0	2752	2800	1	2457	2494	1	1623	1855	6

Appendix B Link Flow Calibration

VM210430 South Ribble - Calibration (Link Flow)

All Vehicles

	07:00:00	08:00:00	09:00:00	10:00:00	11:00:00	12:00:00	13:00:00	14:00:00	15:00:00	16:00:00	17:00:00	18:00:00
	112	112	112	112	112	112	112	112	112	112	112	112
	104	106	111	103	106	107	104	105	103	97	107	108
GEH<5	93%	95%	99%	92%	95%	96%	93%	94%	92%	87%	96%	96%
<3	90 80.4%	84 75.0%	89 79.5%	83 74.1%	97 86.6%	91 81.3%	95 84.8%	93 83.0%	86 76.8%	73 65.2%	92 82.1%	91 81.3%
<4	99 88.4%	96 85.7%	105 93.8%	95 84.8%	101 90.2%	102 91.1%	101 90.2%	101 90.2%	97 86.6%	90 80.4%	102 91.1%	102 91.1%
<5	104 92.9%	106 94.6%	111 99.1%	103 92.0%	106 94.6%	107 95.5%	104 92.9%	105 93.8%	103 92.0%	97 86.6%	107 95.5%	108 96.4%
<6	109 97.3%	110 98.2%	112 100.0%	110 98.2%	108 96.4%	107 95.5%	106 94.6%	108 96.4%	109 97.3%	103 92.0%	107 95.5%	111 99.1%
<7	111 99.1%	111 99.1%	112 100.0%	111 99.1%	111 99.1%	108 96.4%	109 97.3%	110 98.2%	111 99.1%	107 95.5%	110 98.2%	111 99.1%
<8	111 99.1%	111 99.1%	112 100.0%	112 100.0%	112 100.0%	110 98.2%	110 98.2%	111 99.1%	111 99.1%	111 99.1%	111 99.1%	111 99.1%
<9	111 99.1%	111 99.1%	112 100.0%	112 100.0%	112 100.0%	111 99.1%	112 100.0%	112 100.0%	111 99.1%	112 100.0%	112 100.0%	112 100.0%
<10	111 99.1% 1	112 100.0% 0	112 100.0% 0	112 100.0%	112 100.0%	112 100.0%	112 100.0%	112 100.0%	112 100.0%	112 100.0% 0	112 100.0% 0	112 100.0% 0

		07:00:00			08:00:00			09:00:00			10:00:00			11:00:00			12:00:00			13:00:00			14:00:00			15:00:00			16:00:00			17:00:00			18:00:00		
		OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass	OBS	MOD	% Pass
<700 within 100	LOW	80	77	96%	72	69	96%	93	91	98%	94	90	96%	96	94	98%	92	88	96%	91	87	96%	88	85	97%	75	73	97%	67	61	91%	64	61	95%	99	94	95%
700-2700 within 15%	MED	32	31	97%	40	40	100%	19	19	100%	18	15	83%	16	15	94%	20	19	95%	21	20	95%	24	23	96%	37	35	95%	45	41	91%	48	47	98%	13	13	100%
>2700 with 400	HIGH	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a
	ALL	112	108	96%	112	109	97%	112	110	98%	112	105	94%	112	109	97%	112	107	96%	112	107	96%	112	108	96%	112	108	96%	112	102	91%	112	108	96%	112	107	96%
		26			27			28			29			30			31			32			33			34			35			36			37		

All Vehicles

			0700 to 0800			0800 to 0900			0900 to 1000			1000 to 1100			1100 to 1200			1200 to 1300			1300 to 1400			1400 to 1500			1500 to 1600			1600 to 1700			1700 to 1800			1800 to 1900		
Junction	Approach	Link Reference	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH	OBS	MOD	GEH
A59 / John Horrocks Way	A59 Liverpool Road N	907::890	280	273	0	583	520	3	315	356	2	275	264	1	329	321	0	346	342	0	328	345	1	376	373	0	495	428	3	420	429	0	471	492	1	336	377	2
A59 / John Horrocks Way	A59 Liverpool Road SW	908::890	915	865	2	1238	1193	1	729	779	2	658	618	2	630	581	2	694	637	2	693	624	3	757	704	2	950	896	2	909	854	2	878	882	0	633	658	1
A59 / John Horrocks Way	John Horrocks Way SE	910::890	532	534	0	767	718	2	429	518	4	381	367	1	370	409	2	456	486	1	466	490	1	534	531	0	725	666	2	771	687	3	862	828	1	520	552	1
A582 / Golden Way / John Horrocks Way	A582 Golden Way NE	771::772	812	811	0	927	858	2	651	706	2	621	609	0	634	656	1	737	762	1	785	785	0	864	812	2	1021	1029	0	1267	1230	1	1313	1302	0	800	813	0
A582 / Golden Way / John Horrocks Way	Bank Top Road NW	785::784	140	127	1	186	183	0	123	160	3	86	84	0	97	91	1	128	127	0	91	89	0	97	98	0	234	154	6	114	107	1	130	128	0	105	101	0
A582 / Golden Way / John Horrocks Way	John Horrocks Way SW	791::778	818	765	2	916	914	0	583	682	4	509	493	1	471	453	1	483	495	1	472	487	1	511	475	2	706	633	3	678	659	1	666	671	0	489	519	1
A582 / Golden Way / John Horrocks Way	A582 Golden Way SE	789::776	700	631	3	1015	932	3	663	760	4	524	473	2	622	640	1	591	600	0	549	565	1	675	630	2	691	687	0	819	778	1	814	858	2	562	616	2
A582 / Golden Way / John Horrocks Way	Millbrook Way E	786::774	108	109	0	176	168	1	142	153	1	136	104	3	143	119	2	175	148	2	161	126	3	147	107	4	186	167	1	148	124	2	170	170	0	163	172	1
A582 / Cop Lane / Millbrook Way	Cop Lane NW	813::810	127	134	1	294	355	3	202	244	3	170	171	0	184	181	0	256	268	1	198	239	3	213	210	0	342	358	1	232	185	3	231	268	2	204	220	1
A582 / Cop Lane / Millbrook Way	Millbrook Way SW	873::810	49	60	1	110	118	1	94	106	1	104	103	0	128	129	0	141	137	0	129	123	1	123	122	0	182	177	0	146	148	0	129	134	0	125	142	1
A582 / Cop Lane / Millbrook Way	Cop Lane SE	811::810	271	233	2	513	502	0	307	322	1	291	288	0	316	291	1	344	347	0	307	313	0	339	340	0	446	450	0	360	345	1	423	455	2	330	339	0
A582 / Cop Lane / Millbrook Way	A582 Golden Way off-slip NE	875::810	97	68	3	165	143	2	124	98	2	148	93	5	166	158	1	217	178	3	204	165	3	231	205	2	273	197	5	323	211	7	286	217	4	227	181	3
A582 / Cop Lane / Cromwell Rd	Cop Lane NW	814::813	124	137	1	295	351	3	198	238	3	172	172	0	179	179	0	255	267	1	192	228	2	208	214	0	340	351	1	239	186	4	223	264	3	199	216	1
A582 / Cop Lane / Cromwell Rd	Cop Lane NW	1099::814	107	90	2	153	133	2	85	82	0	64	42	3	46	46	0	73	75	0	75	89	2	68	71	0	111	113	0	66	53	2	62	44	2	48	38	2
A582 / Cop Lane / Cromwell Rd	Cronwell Road SW	874::813	11	15	1	15	26	2	10	12	1	8	9	0	14	11	1	13	14	0	8	12	1	18	18	0	13	15	1	4	15	4	15	13	1	11	12	0
A582 / Cop Lane / Cromwell Rd	Cop Lane SE	810::813	309	269	2	589	560	1	336	346	1	344	323	1	388	376	1	409	417	0	371	398	1	457	457	0	556	560	0	505	461	2	508	519	0	376	392	1
A59 / Liverpool Rd	A59 Liverpool Road NE	719::714	137	107	3	311	244	4	205	168	3	205	188	1	233	216	1	276	248	2	247	220	2	296	265	2	240	159	6	302	264	2	398	365	2	231	217	1
A59 / Liverpool Rd	A59 Liverpool Road NE	720::719	260	251	1	355	357	0	284	268	1	331	303	2	364	368	0	431	421	0	414	409	0	520	495	1	584	680	4	687	661	1	717	624	4	385	377	0
A59 / Liverpool Rd	A59 Liverpool Road SW	717::714	354	310	2	652	430	10	425	401	1	335	298	2	378	318	3	413	318	5	442	309	7	349	311	2	417	350	3	413	402	1	440	416	1	332	346	1
A59 / Liverpool Rd	A59 S	715::714	186	190	0	262	269	0	203	249	3	131	132	0	161	181	2	156	205	4	131	201	5	134	179	4	257	199	4	179	171	1	272	207	4	166	179	1
A59 / Liverpool Rd	A59 S	716::717	105	116	1	313	285	2	137	160	2	184	177	1	207	201	0	219	214	0	192	180	1	254	227	2	290	305	1	251	223	2	277	261	1	190	202	1
A59 / Golden Way	A59 NW	696::688	1026	971	2	1046	979	2	815	787	1	793	700	3	809	789	1	991	937	2	992	950	1	1114	1034	2	1214	1087	4	1557	1478	2	1616	1530	2	1091	1078	0
A59 / Golden Way	A582 Golden Way SE	694::686	1539	1409	3	1720	1684	1	1226	1336	3	1070	829	8	1058	928	4	1081	962	4	1069	951	4	1060	897	5	1217	1086	4	1265	1177	3	1183	1210	1	925	925	0
A59 / Golden Way	A59 E	684::685	750	763	0	831	852	1	572	639	3	478	495	1	496	526	1	500	544	2	550	577	1	563	591	1	748	795	2	741	666	3	747	754	0	490	549	3
A59 Slip	A59 NW	702::703	42	31	2	129	97	3	80	58	3	107	86	2	118	109	1	115	109	1	99	92	1	137	132	0	142	171	2	119	112	1	145	127	2	92	86	1
A59 / B5254 Leyland Rd	A59 NW	683::679	411	392	1	671	560	4	447	437	0	441	429	1	483	497	1	562	545	1	566	521	2	640	625	1	850	849	0	834	838	0	906	813	3	499	524	1
A59 / B5254 Leyland Rd	A59 SW	682::677	229	272	3	286	311	1	261	320	3	204	236	2	210	238	2	250	312	4	248	325	5	277	315	2	305	388	4	351	396	2	407	436	1	286	360	4
A59 / B5254 Leyland Rd	B5254 Leyland Road SE	662::675	819	836	1	899	952	2	631	681	2	464	466	0	548	524	1	544	544	0	526	548	1	529	553	1	595	596	0	691	557	5	650	677	1	536	625	4
B5254 Leyland Rd / Marshalls Brow	B5254 Leyland Road N	673::668	483	532	2	596	619	1	483	510	1	431	439	0	462	470	0	584	566	1	577	561	1	603	611	0	770	743	1	824	835	0	900	845	2	583	697	5
B5254 Leyland Rd / Marshalls Brow	Marshalls Brow W	664::670	131	154	2	250	210	3	162	173	1	152	148	0	149	153	0	163	161	0	134	136	0	167	160	1	209	235	2	167	152	1	151	179	2	153	169	1
B5254 Leyland Rd / Marshalls Brow	B5254 Leyland Road S	674::669	774	789	1	797	892	3	555	612	2	476	443	2	508	509	0	548	527	1	522	541	1	535	547	1	582	549	1	699	577	5	636	687	2	508	606	4
A582 Penwortham Way / Pope Lane	A582 Golden Way NW	833::838	577	552	1	669	598	3	537	633	4	495	475	1	507	523	1	569	592	1	573	583	0	623	561	3	784	709	3	761	743	1	805	809	0	503	562	3
A582 Penwortham Way / Pope Lane	A582 Golden Way NW	833::1071	13	24	3	77	43	4	37	40	0	47	42	1	46	55	1	39	39	0	43	49	1	45	58	2	112	108	0	46	48	0	60	76	2	49	71	3
A582 Penwortham Way / Pope Lane	Pope Lane SW	823::1072	93	68	3	198	121	6	115	101	1	83	52	4	87	88	0	101	90	1	85	77	1	101	83	2	139	106	3	133	89	4	134	86	5	80	78	0
A582 Penwortham Way / Pope Lane	Pope Lane SW	823::839	143	122	2	234	168	5	123	119	0	112	96	2	87	72	2	111	101	1	96	101	1	123	108	1	206	148	4	194	105	7	207	102	8	109	87	2
A582 Penwortham Way / Pope Lane	A582 Penwortham Way SE	817::839	617	560	2	763	803	1	560	655	4	478	427	2	538	547	0	520	505	1	530	502	1	612	539	3	584	575	0	738	732	0	764	856	3	507	549	2
A582 Penwortham Way / Pope Lane	Pope Lane NE	822::838	139	119	2	293	224	4	112	115	0	121	127	1	118	138	2	130	154	2	144	162	1	159	177	1	179	193	1	176	151	2	161	158	0	117	147	3
A582 Penwortham Way / Pope Lane	Pope Lane NE	822::1069	133	92	4	175	128	4	125	123	0	98	77	2	111	100	1	109	91	2	121	113	1	133	102	3	148	116	3	113	77	4	116	96	2	78	64	2
B5254 Leyland Rd / New Lane	B5254 Leyland Road N	641::640	492	577	4	626	622	0	502	516	1	431	423	0	479	475	0	580	541	2	567	546	1	597	596	0	704	714	0	803	749	2	830	802	1	523	610	4
B5254 Leyland Rd / New Lane	New Lane W	871::640	153	169	1	186	245	4	160	228	5	129	145	1	108	149	4	154	201	4	131	200	5	119	180	5	195	235	3	149	164	1	158	195	3	149	201	4
B5254 Leyland Rd / New Lane	B5254 Leyland Road S	639::640	838	860	1	927	1070	5	598	696	4	539	532	0	580	627	2	590	651	2	598	664	3	636	697	2	720	748	1	837	741	3	817	910	3	643	767	5
B5254 Leyland Rd / The Cawsey	B5254 Leyland Road N	551::552	667	652	1	737	687	2	600	578	1	490	440	2	523	491	1	631	583	2	620	594	1	639	628	0	773	800	1	861	752	4	912	831	3	569	645	3
B5254 Leyland Rd / The Cawsey	Bee Lane W	548::549	11	0	5	17	0	6	17	0	6	12	0	5	17	0	6	18	0	6	18	0	6	15	0	5	10	0	4	15	0	5	6	0	3	9	0	4
B5254 Leyland Rd / The Cawsey	B5254 Leyland Road S	545::546	687	642	2	711	741	1	531	561	1	483	437	2	534	509	1	529	525	0	553	552	0	562	543	1	705	597	4	743	586	6	719	723	0	546	625	3
B5254 Leyland Rd / The Cawsey	The Cawsey E	542::554	335	356	1	457	443	1	220	193	2	211	191	1	239	223	1	259	248	1	239	214	2	301	308	0	346	348	0	415	334	4	439	384	3	332	308	1
A6 London Way / Brownedge Rd	A6 London Way N	595::569	708	661	2	854	799	2	688	681	0	714	688	1	803	810	0	920	897	1	927	928	0	961	939	1	1085	1074	0	1310	1254	2	1238	1220	1	807	804	0
A6 London Way / Brownedge Rd	B5257 Brownedge Road W	572::567	298	274	1	377	387	1	259	220	3	229	162	5	186	175	1	227	200	2	256	247	1	241	231	1	354	352	0	322	238	5	298	235	4	217	208	1
A6 London Way / Brownedge Rd	A6 London Way S	210::565	1029	943	3	1201	1068	4	976	1000	1	857	774	3	904	884	1	969	954	0	948	930	1	1047	997	2	1084	1041	1	1277	1147	4	1322	1303	1	897	918	1
A6 London Way / Brownedge Rd	B5257 Brownedge Road E	573::571	397	344	3	542	527	1	349	321	2	321	236	5	330	253	5	335	259	4	229	261	2	204	303	6	407	394	1	459	442	1	452	456	0	306	300	0
B5254 Leyland Rd / Coote Lane	B5254 Leyland Road NW	481::404	624	633	0	644	644	0	527	515	1	439	390	2	485	455	1	571	534	2	502	494	0	552	564	1	639	626	1	668	630	1	699	686	0	484	582	4
B5254 Leyland Rd / Coote Lane	Coote Lane SW	405::404	176	121	5	228	157	5	145	100	4	123	74	5	141	88	5	176	122	4	165	121	4	151	70	8	206	128	6	237	147	6	246	155	6	137	103	3
B5254 Leyland Rd / Coote Lane	B5254 Leyland Road SE	632::404	710	608	4	738	718	1	578	538	2	570	437	6	593	499	4	613	513	4	624	527	4	650	546	4	658	596	2	848	691	6	819	804	1	604	641	1
B5254 Leyland Rd / Brownedge Rd	B5254 Leyland Road NW	632::403	726	692	1	784	730	2	595	545	2	512	399	5	549	460	4	655	551	4	610	533	3	633	551	3	738	651	3	821	714	4	833	761	3	549	605	2
B5254 Leyland Rd / Brownedge Rd	B5254 Watkin Lane SE	402::403	651	574	3	707	685	1	519	501	1	523	426	4	531	466	3	563	483	3	566	493	3	637	584	2	604	616	0	823	696	5	759	784	1	591	629	2
B5254 Leyland Rd / Brownedge Rd	B5257 Brownedge Road E	443::403	203	220	1	284	321	2	264	269	0	227	225	0	261	264	0	268	270	0	262	264	0	251	241	1	333	306	2	288	295	0	306	307	0	225	237	1
B5254 Watkin Lane / Jubilee Rd	B5254 Watkin Lane NW	402::259	638	623	1	599	630	1	561	557	0	503	435	3	509	466	2	585	525	3	550	522	1	538	510	1	647	656	0	695	735	1	727	743	1	460	576	5
B5254 Watkin Lane / Jubilee Rd	Jubilee Road SW	627::259	175	176	0	238	232	0	175	178	0	170	133	3	187	152	3	193	160	2	194	152	3	212	193	1	242	283	3	352	314	2	248	317	4	168	193	2
B5254 Watkin Lane / Jubilee Rd	B5254 Watkin Lane SE	258::259	592	524	3	620	609	0	497	481	1	482	413	3	493	446	2	502	448	2	523	470	2	578	513	3	562	528	1	739	664	3	707	736	1	537	600	3
A6 / A582	A6 London Way N	216::101	981	935	1	1092	1022	2	787	805	1	786	735	2	858	855	0	947	943	0	984	969	0	989	991	0	1200	1202	0	1400	1332	2	1318	1327	0	863	867	0
A6 / A582	A582 Lostock Lane W	218::217	241	248	0	284	281	0	268	318	3	219	207	1	251	269	1	263	285	1	234	249	1	269	272	0	282	273	1	291	355	4	293	347	3	221	274	3
A6 / A582	A582 Lostock Lane W	217::99	1587	1420	4	1427	1459	1	1195	1181	0	1057	908	5	1134	1085	1	1232	1158	2	1147	1113	1	1189	1090	3	1322	1265	2	1511	1235	7	1502	1383	3	925	987	2
A6 / A582	M65 S	96::97	711	652	2	756	662	4	546	540	0	454	335	6	485	457	1	475	472	0	479	488	0	563	513	2	584	543	2	752	695	2	764	777	0	465	466	0
A6 / A582	M65 S	87::104	1128	954	5	982	887	3	717	672	2	693	620	3	679	653	1	647	636	0	697	702	0	737	725	0	876	782	3	1086	971	4	1124	1123	0	652	641	0
A6 / A582	A6 Lostock Lane E	182::103	570	578	0	752	652	4	754	656	4	854	698	6	887	711	6	867	663	7	907	676	8	1044	855	6	1007	838	6	1083	849	8	1121	914	6	795	744	2
M6 / A6 / Church Rd	M6 Preston Bypass NE	39::31	662	632	1	650	612	2	479	457	1	408	401	0	472	452	1	430	425	0	467	465	0	566	545	1	649	609	2	882	816	2	862	850	0	407	403	0
M6 / A6 / Church Rd	A6 Lostock Lane W	42::27	1010	942	2	1048	1013	1	812	827	1	738	714	1	759	742	1	829	820	0	825	866	1	858	793	2	946	884	2	1088	1026	2	1040	1047	0	674	653	1
M6 / A6 / Church Rd	M6 Preston Bypass SW	24::25	377	303	4	388	361	1	250	204	3	231	184	3	226	228	0	196	218	2	203	202	0	260	264	0	222	222	0	254	189	4	265	270	0	162	185	2
M6 / A6 / Church Rd	M6 Preston Bypass SW	19::24	143	86	5	157	133	2	83	84	0	81	71	1	80	101	2	72	79	1	107	112	0	97	106	1	99	117	2	118	99	2	127	110	2	80	66	2
M6 / A6 / Church Rd	Church Road SE	38::33	912	840	2	1027	1023	0	847	796	2	736	727	0	768	751	1	778	768	0	883	879	0	956	940	1	890	841	2	1045	978	2	1079	1051	1	634	637	0
M6 / M65	M6 Preston Bypass NE	20::9	366	261	6	363	349	1	301	365	4	239	302	4	240	366	7	288	457	9	281	426	8	357	442	4	416	456	2	502	548	2	493	657	7	258	279	1
M6 / M65	M6 Preston Bypass NE	37::20	166	131	3	151	136	1	109	97	1	95	81	1	100	91	1	89	104	2	108	111	0	118	100	2	142	108	3	162	152	1	137	134	0	67	68	0
M6 / M65	M65 W	18::5	512	437	3	535	472	3	375	335	2	305	233	4	328	294	2	338	292	3	373	398	1	365	311	3	436	417	1	563	487	3	550	555	0	272	313	2
M6 / M65	M6 Preston Bypass SW	1::2	1220	1163	2	1066	1108	1	756	760	0	681	670	0	688	686	0	664	687	1	708	676	1	761	767	0	784	789	0	1080	1027	2	1063	1050	0	646	649	0
M6 / M65	M6 Preston Bypass SW	62::1	467	525	3	475	402	3	339	324	1	257	247	1	275	257	1	243	221	1	298	292	0	269	250	1	314	297	1	359	388	2	396	440	2	232	247	1
M6 / M65	M65 E	22::13	116	120	0	106	133	2	78	80	0	69	71	0	63	111	5	60	94	4	94	79	2	83	123	4	82	124	4	107	96	1	100	96	0	60	66	1
M6 / M65	M65 E	65::22	934	933	0	900	902	0	657	662	0	593	582	0	529	530	0	557	557	0	610	607	0	670	670	0	747	747	0	1023	1004	1	932	934	0	511	520	0
A582 / Croston Rd / Centurian Way	Croston Road N	283::280	210	157	4	234	162	5	163	118	4	141	124	1	141	141	0	134	140	1	161	154	1	154	157	0	210	138	5	224	203	1	196	180	1	125	96	3
A582 / Croston Rd / Centurian Way	A582 SW	621::278	1130	1059	2	1208	1152	2	944	1008	2	837	803	1	796	856	2	882	920	1	912	946	1	964	1005	1	1072	1144	2	1178	1103	2	1049	1127	2	718	763	2
A582 / Croston Rd / Centurian Way	Centurion Way SE	282::276	150	84	6	138	118	2	90	65	3	217	172	3	295	260	2	266	219	3	108	95	1	228	203	2	258	241	1	512	343	8	305	303	0	121	242	9

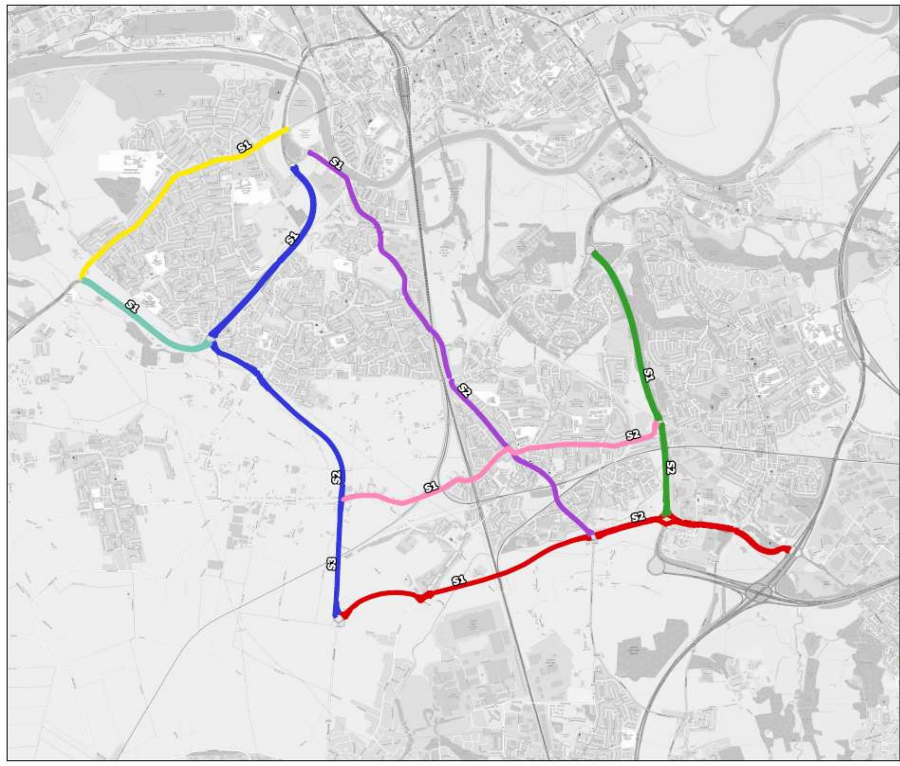
A582 / Croston Rd / Centurian Way	A582 Farington Road E	273::274	980	952	1	965	959	0	766	826	2	800	748	2	843	843	0	786	804	1	829	819	0	938	921	1	974	982	0	1095	993	3	1201	1167	1	680	688	0
A582 / Croston Rd / Fidler Lane	A582 NE	620::285	986	984	0	1063	1055	0	811	878	2	815	719	3	864	845	1	822	816	0	860	820	1	981	947	1	1106	1081	1	1341	1187	4	1318	1315	0	735	822	3
A582 / Croston Rd / Fidler Lane	A582 Flensburg Way NW	295::291	788	728	2	870	834	1	783	849	2	743	732	0	697	777	3	747	819	3	778	816	1	828	836	0	1029	1017	0	994	889	3	884	974	3	616	625	0
A582 / Croston Rd / Fidler Lane	Croston Road SW	294::289	480	477	0	517	459	3	280	272	0	194	163	2	189	171	1	237	212	2	237	206	2	270	244	2	310	308	0	406	405	0	261	257	0	168	193	2
A582 Penwortham Way / Flensburg Way	A582 Penwortham Way N	360::350	861	820	1	934	910	1	801	880	3	712	687	1	686	731	2	752	829	3	757	837	3	838	789	2	988	937	2	991	944	2	933	1012	3	632	672	2
A582 Penwortham Way / Flensburg Way	B5253 Flensburg Way S	357::346	552	402	7	551	441	5	543	510	1	522	421	5	530	478	2	564	504	3	539	474	3	555	498	2	511	470	2	601	569	1	722	658	2	489	407	4
A582 Penwortham Way / Flensburg Way	A582 Flensburg Way NE	342::343	828	855	1	918	889	1	613	725	4	623	637	1	671	748	3	601	677	3	606	677	3	741	792	2	747	832	3	933	877	2	1006	1005	0	605	640	1
A582 Penwortham Way / Chain House Lane	A582 Penwortham Way N	376::375	681	630	2	726	692	1	589	687	4	516	490	1	521	561	2	559	605	2	568	602	1	650	573	3	750	680	3	716	712	0	750	753	0	496	521	1
A582 Penwortham Way / Chain House Lane	Chain House Lane W	389::375	370	307	3	379	363	1	285	284	0	279	224	3	246	227	1	304	266	2	319	285	2	293	265	2	402	360	2	524	516	0	416	513	5	247	272	2
A582 Penwortham Way / Chain House Lane	A582 Penwortham Way S	374::375	590	541	2	714	687	1	530	611	3	479	436	2	534	532	0	482	495	1	494	486	0	570	505	3	548	504	2	708	670	1	724	713	0	482	499	1
A582 Penwortham Way / Chain House Lane	Chain House Lane E	386::375	259	85	13	313	251	4	200	172	2	143	74	7	164	88	7	195	104	7	220	112	8	200	100	8	249	125	9	287	233	3	286	242	3	157	123	3
A6 / Carwood Rd	A6 London Way N	619::602	491	473	1	634	621	1	652	629	1	725	677	2	816	819	0	929	938	0	955	955	0	1000	1012	0	1096	1088	0	1395	1356	1	1358	1346	0	902	900	0
A6 / Carwood Rd	Carwood Road SW	510::600	468	462	0	591	595	0	316	335	1	312	297	1	297	287	1	342	333	0	341	339	0	356	344	1	454	436	1	458	386	4	498	458	2	315	359	2
A6 / Carwood Rd	A6 London Way SE	597::598	938	882	2	1062	1010	2	896	925	1	816	735	3	797	798	0	816	836	1	824	826	0	872	859	0	889	915	1	977	888	3	999	1017	1	723	745	1
A6 / Carwood Rd	Hennel Lane E	608::604	284	288	0	404	364	2	242	248	0	207	171	3	234	236	0	262	268	0	238	236	0	230	233	0	363	357	0	320	322	0	365	370	0	281	291	1
Cop Lane / Hill Rd S	Hill Road South NE	860::812	68	69	0	122	114	1	75	82	1	68	71	0	66	70	0	80	80	0	70	68	0	90	94	0	118	119	0	79	75	0	84	92	1	88	81	1
Cop Lane / Hill Rd S	Cop Lane NW	811::812	160	133	2	352	387	2	252	256	0	222	197	2	281	258	1	362	339	1	309	315	0	327	300	2	492	440	2	403	293	6	401	382	1	350	347	0
Cop Lane / Hill Rd S	Cop Lane SE	1007::812	232	205	2	463	452	1	293	297	0	264	264	0	304	283	1	324	323	0	303	309	0	303	303	0	410	421	1	376	353	1	415	449	2	305	326	1
Cop Lane / Pope Lane	Pope Lane E	849::847	222	217	0	493	501	0	276	308	2	265	271	0	283	295	1	328	338	1	309	320	1	332	326	0	422	409	1	407	399	0	385	461	4	308	379	4
Cop Lane / Pope Lane	Cop Lane NW	1007::847	172	151	2	332	368	2	242	243	0	200	179	2	271	245	2	317	299	1	289	295	0	283	265	1	454	400	3	349	256	5	373	330	2	297	300	0
Cop Lane / Pope Lane	Pope Lane SW	846::847	146	167	2	221	300	5	200	253	4	177	186	1	179	175	0	187	196	1	210	240	2	202	223	1	257	268	1	260	251	1	273	301	2	188	230	3
A582 / B5254 / Stanifield Lane	B5254 Watkin Lane NW	230::236	720	687	1	663	712	2	564	615	2	494	434	3	480	467	1	600	558	2	526	552	1	519	525	0	593	669	3	715	667	2	723	737	1	438	564	6
A582 / B5254 / Stanifield Lane	A582 Farington Road W	241::242	10	29	4	25	50	4	18	44	5	24	35	2	17	40	4	32	41	1	17	40	4	27	47	3	22	56	5	23	48	4	32	53	3	17	49	6
A582 / B5254 / Stanifield Lane	A582 Farington Road W	242::234	942	771	6	990	886	3	862	863	0	812	718	3	818	848	1	926	908	1	808	825	1	887	868	1	951	923	1	1036	918	4	1036	1001	1	655	679	1
A582 / B5254 / Stanifield Lane	A5083 Stanfield Lane S	239::232	460	476	1	493	507	1	463	434	1	388	371	1	475	484	0	465	470	0	463	464	0	479	488	0	495	471	1	561	543	1	503	549	2	387	435	2
A582 / B5254 / Stanifield Lane	A582 Lostock Lane E	204::205	1398	1211	5	1325	1140	5	1029	1008	1	1077	896	6	1079	989	3	1056	938	4	1075	965	3	1254	1096	5	1383	1157	6	1611	1365	6	1625	1511	3	1032	964	2
A6 / B6258 / Wigan Rd	B6258 Station Road NE	157::140	197	223	2	244	289	3	225	237	1	280	236	3	250	309	4	239	300	4	263	277	1	319	331	1	297	342	3	276	291	1	300	323	1	244	268	2
A6 / B6258 / Wigan Rd	B6258 Station Road NE	159::158	358	364	0	344	360	1	263	278	1	215	226	1	226	238	1	249	266	1	237	255	1	267	258	1	322	328	0	383	382	0	350	361	1	200	211	1
A6 / B6258 / Wigan Rd	A6 Lostock Lane W	165::140	589	555	1	714	653	2	589	609	1	623	598	1	672	634	1	714	685	1	706	759	2	736	682	2	750	681	3	775	730	2	787	777	0	602	553	2
A6 / B6258 / Wigan Rd	A6 Lostock Lane W	172::140	73	64	1	88	83	1	104	101	0	118	90	3	147	119	2	176	134	3	156	132	2	179	143	3	158	128	3	199	163	3	211	241	2	157	148	1
A6 / B6258 / Wigan Rd	A49 Wigan Road SW	149::140	234	217	1	297	274	1	200	192	1	187	175	1	157	159	0	200	201	0	201	198	0	257	239	1	227	233	0	333	300	2	257	275	1	169	181	1
A6 / B6258 / Wigan Rd	A6 Lostock Lane SE	148::140	288	304	1	336	354	1	236	243	0	227	237	1	231	276	3	223	264	3	287	295	0	267	320	3	252	293	2	309	314	0	353	379	1	202	206	0
A6 / B6258 / Wigan Rd	A6 Lostock Lane SE	139::140	509	498	0	597	562	1	547	440	5	495	400	4	550	398	7	512	323	9	511	371	7	600	470	6	589	473	5	668	492	7	687	494	8	422	388	2

Appendix C Journey Time Validation by Section

AM Average journey time (s)					
08:00:00					
	OBS	MOD	Diff (s)	Diff (%)	Pass/Fail
Route 1 NB	375	332	-43	-11%	PASS
Route 1 SB	328	341	13	4%	PASS
Route 2 EB	476	516	39	8%	PASS
Route 2 WB	422	451	30	7%	PASS
Route 3 NB	127	120	-7	-6%	PASS
Route 3 SB	138	134	-4	-3%	PASS
Route 4 NB	589	593	4	1%	PASS
Route 4 SB	518	541	22	4%	PASS
Route 5 NB	334	325	-10	-3%	PASS
Route 5 SB	356	365	8	2%	PASS
Route 6 EB	456	413	-43	-9%	PASS
Route 6 WB	395	387	-9	-2%	PASS
Route 7 EB	86	112	26	31%	PASS
Route 7 WB	79	64	-15	-19%	PASS
				Count	**14**
				PASS	**100%**
				FAIL	**0%**

PM Average journey time (s)					
17:00:00					
	OBS	MOD	Diff (s)	Diff (%)	Pass/Fail
Route 1 NB	365	336	-29	-8%	PASS
Route 1 SB	332	346	14	4%	PASS
Route 2 EB	455	450	-5	-1%	PASS
Route 2 WB	511	560	49	10%	PASS
Route 3 NB	140	125	-15	-11%	PASS
Route 3 SB	151	134	-17	-11%	PASS
Route 4 NB	513	497	-16	-3%	PASS
Route 4 SB	518	566	48	9%	PASS
Route 5 NB	300	280	-20	-7%	PASS
Route 5 SB	302	318	16	5%	PASS
Route 6 EB	431	461	30	7%	PASS
Route 6 WB	423	440	17	4%	PASS
Route 7 EB	80	69	-12	-14%	PASS
Route 7 WB	71	64	-7	-9%	PASS
				Count	**14**
				PASS	**100%**
				FAIL	**0%**

Inter Peak Average journey time (s)					
12:00:00					
	OBS	MOD	Diff (s)	Diff (%)	Pass/Fail
Route 1 NB	366	314	-52	-14%	PASS
Route 1 SB	325	334	8	3%	PASS
Route 2 EB	423	410	-13	-3%	PASS
Route 2 WB	494	556	62	12%	PASS
Route 3 NB	158	116	-41	-26%	PASS
Route 3 SB	140	130	-9	-7%	PASS
Route 4 NB	426	389	-37	-9%	PASS
Route 4 SB	456	382	-75	-16%	FAIL
Route 5 NB	439	477	38	9%	PASS
Route 5 SB	305	253	-52	-17%	PASS
Route 6 EB	352	314	-38	-11%	PASS
Route 6 WB	393	356	-37	-9%	PASS
Route 7 EB	84	72	-13	-15%	PASS
Route 7 WB	72	62	-11	-15%	PASS
				Count	**14**
				PASS	**93%**
				FAIL	**7%**



Legend

Journey Paths
- Route 1
- Route 2
- Route 3
- Route 4
- Route 5
- Route 6
- Route 7

CLIENT: Taylor Wimpey

PROJECT: VM210430 South Ribble

TITLE: Journey Time Paths

SCALE: NTS

DRAWN:	CHECKED:	DATE:	REVISION:
RD	BN	23/06/2021	1

vectos microsim.

7th Floor, 36 Great Charles Street, Birmingham, B3 3JY
Tel: 0121 289 5610 Email: microsim@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:

AM Average journey time (s)					
08:00:00					
	OBS	MOD	Diff (s)	Diff (%)	Pass/Fail
Route 1 Section 1 NB	101	98	3	-3%	PASS
Route 1 Section 1 SB	105	96	9	-8%	PASS
Route 1 Section 2 NB	168	151	16	-10%	PASS
Route 1 Section 2 SB	151	178	-27	17%	PASS
Route 1 Section 3 NB	106	83	23	-22%	PASS
Route 1 Section 3 SB	71	66	5	-7%	PASS
Route 2 Section 1 EB	242	281	-39	16%	PASS
Route 2 Section 1 WB	188	199	-11	6%	PASS
Route 2 Section 2 EB	234	235	-1	0%	PASS
Route 2 Section 2 WB	234	252	-18	8%	PASS
Route 3 Section 1 NB	77	70	8	-10%	PASS
Route 3 Section 1 SB	79	70	9	-11%	PASS
Route 3 Section 2 NB	49	50	-1	2%	PASS
Route 3 Section 2 SB	60	64	-4	7%	PASS
Route 4 Section 1 NB	302	281	21	-7%	PASS
Route 4 Section 1 SB	248	227	22	-9%	PASS
Route 4 Section 2 NB	288	313	-25	9%	PASS
Route 4 Section 2 SB	270	314	-44	16%	PASS
Route 5 NB	334	325	10	-3%	PASS
Route 5 SB	356	365	-8	2%	PASS
Route 6 Section 1 EB	229	194	35	-15%	PASS
Route 6 Section 1 WB	195	184	11	-6%	PASS
Route 6 Section 2 EB	227	219	8	-4%	PASS
Route 6 Section 2 WB	200	203	-3	1%	PASS
Route 7 EB	86	112	-26	31%	PASS
Route 7 WB	79	64	15	-19%	PASS
				Count	**26**
				PASS	**100%**
				FAIL	**0%**

PM Average journey time (s)					
17:00:00					
	OBS	MOD	Diff (s)	Diff (%)	Pass/Fail
Route 1 Section 1 NB	97	95	2	-2%	PASS
Route 1 Section 1 SB	107	95	12	-11%	PASS
Route 1 Section 2 NB	158	159	-1	1%	PASS
Route 1 Section 2 SB	153	184	-31	20%	PASS
Route 1 Section 3 NB	111	83	28	-25%	PASS
Route 1 Section 3 SB	71	67	5	-6%	PASS
Route 2 Section 1 EB	210	182	28	-13%	PASS
Route 2 Section 1 WB	217	215	2	-1%	PASS
Route 2 Section 2 EB	245	268	-23	10%	PASS
Route 2 Section 2 WB	294	345	-52	18%	PASS
Route 3 Section 1 NB	88	72	17	-19%	PASS
Route 3 Section 1 SB	80	75	5	-6%	PASS
Route 3 Section 2 NB	52	54	-2	3%	PASS
Route 3 Section 2 SB	71	59	12	-17%	PASS
Route 4 Section 1 NB	241	258	-16	7%	PASS
Route 4 Section 1 SB	263	369	-106	40%	FAIL
Route 4 Section 2 NB	272	239	33	-12%	PASS
Route 4 Section 2 SB	255	197	58	-23%	PASS
Route 5 NB	300	280	20	-7%	PASS
Route 5 SB	302	318	-16	5%	PASS
Route 6 Section 1 EB	233	261	-28	12%	PASS
Route 6 Section 1 WB	204	197	7	-4%	PASS
Route 6 Section 2 EB	198	200	-2	1%	PASS
Route 6 Section 2 WB	219	243	-24	11%	PASS
Route 7 EB	80	69	12	-14%	PASS
Route 7 WB	71	64	7	-9%	PASS
				Count	**26**
				PASS	**96%**
				FAIL	**4%**

Interpeak Average journey time (s)					
12:00:00					
	OBS	MOD	Diff (s)	Diff (%)	Pass/Fail
Route 1 Section 1 NB	89	94	-5	5%	PASS
Route 1 Section 1 SB	106	94	12	-12%	PASS
Route 1 Section 2 NB	176	141	35	-20%	PASS
Route 1 Section 2 SB	148	175	-27	18%	PASS
Route 1 Section 3 NB	101	79	22	-22%	PASS
Route 1 Section 3 SB	71	65	6	-9%	PASS
Route 2 Section 1 EB	195	199	-4	2%	PASS
Route 2 Section 1 WB	210	161	49	-23%	PASS
Route 2 Section 2 EB	228	211	17	-8%	PASS
Route 2 Section 2 WB	284	395	-111	39%	FAIL
Route 3 Section 1 NB	107	70	38	-35%	PASS
Route 3 Section 1 SB	79	68	11	-14%	PASS
Route 3 Section 2 NB	50	47	3	-7%	PASS
Route 3 Section 2 SB	60	62	-2	3%	PASS
Route 4 Section 1 NB	232	201	31	-13%	PASS
Route 4 Section 1 SB	228	197	31	-14%	PASS
Route 4 Section 2 NB	194	188	6	-3%	PASS
Route 4 Section 2 SB	228	185	44	-19%	PASS
Route 5 NB	439	477	-38	9%	PASS
Route 5 SB	305	253	52	-17%	PASS
Route 6 Section 1 EB	181	125	56	-31%	PASS
Route 6 Section 1 WB	185	164	21	-11%	PASS
Route 6 Section 2 EB	171	189	-18	10%	PASS
Route 6 Section 2 WB	207	192	15	-7%	PASS
Route 7 EB	84	72	13	-15%	PASS
Route 7 WB	72	62	11	-15%	PASS
				Count	**26**
				PASS	**96%**
				FAIL	**4%**

Appendix D Model Audit Report

SOUTH RIBBLE INITIAL MODEL AUDIT NOTE

SOUTH RIBBLE MODEL AUDIT

SOUTH RIBBLE INITIAL MODEL AUDIT

IDENTIFICATION TABLE	
Client/Project owner	Vectos Microsim
Project	South Ribble Model Audit
Title of Document	South Ribble Initial Model Audit
Type of Document	South Ribble Initial Model Audit Note
Date	23/07/2021
Reference number	GB01T21C91\11073812\001
Number of pages	9

APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Graham Smith	Senior Transportation Consultant	14/07/2021	Initial Audit
	Checked by	Malcolm Calvert	Director	16/07/2021	
	Approved by	Malcolm Calvert	Director	16/07/2021	
2	Author	Graham Smith	Senior Transportation Consultant	23/07/2021	Final Audit

TABLE OF CONTENTS

1. INTRODUCTION

1.1.1 SYSTRA Ltd (SYSTRA) was commissioned by Vectos Microsim (Vectos) to audit the South Ribble Base Model. This report provides an initial review of the model network.

1.1.2 The model includes the A59, A582, A6 and M6 Junction 29 in the Lower Penwortham and Lowstock Hall areas to the south of Preston, Lancashire.

1.1.3 For the purposes of the audit, Vectos provided the following:

- VM210430 South Ribble 2021 Base Model
- South Ribble Paramics Model, Draft Local Model Validation Report (LMVR)
- VM210430.Sp004 Calibration and Validation Spreadsheet

2. BASE MODEL REVIEW

2.1 Errors and Warnings

2.1.1 No warnings or errors displayed when the model opens.

2.2 Version

2.2.1 The model has been developed using Paramics Discovery version 24.

2.2.2 Paramics Discovery v24 is deemed appropriate for the purposes of current studies.

2.3 Network Wide Behaviour Parameters

2.3.1 Aggression, Awareness, Mean Headway, Min Gap, Overtaking, Timesteps and Signal Parameters are all set using their default values, which appears appropriate.

3. ASSIGNMENT, ZONES AND CAR PARKS

3.1 Generalised Cost Equation Coefficients

3.1.1 A separate generalised cost equation has been adopted for each individual vehicle type, which is appropriate for a study area of this nature. The LMVR details that these cost equations have been derived based on TAG guidance, which appears appropriate.

3.2 Major and Minor Links

3.2.1 The South Ribble Base Model has been coded using both 'Major' and 'Minor' links as part of the network development. The Major/Minor hierarchy seems reasonable and appears to have been generally coded consistently.

3.3 Urban and Highway Links

3.3.1 The A46 Base Model has been coded using only Urban Links. This is appropriate for a model of this scope. It is noted that the LMVR highlights sections of the model that are coded as Highway links in Figure 5. This should be checked for consistency.

3.4 Speed Limits

3.4.1 In general it appears as if link category speeds have been coded in line with signposted speed limits. A possible exception to this is the section of Flensburg Way between Tank roundabout and the double roundabout with Croston Road. This has been coded as 30mph in the model but appears to be national speed limit on the ground, according to Google Street View. It is noted that the Street View images may be out of date.

A review of the speed limit of Flensburg Way is recommended.

3.4.2 It is noted that the link speed has been altered from the category speed on a large number of links, including the following sections

- A6 London Way between Brownedge Road Roundabout and south of Carwood Road Roundabout. Coded speed has been reduced from 60mph to 50mph.
- A6 between Brownedge Road Roundabout and the A582 Roundabout. Coded speed has been reduced from 60mph to 40mph.
- Brownedge Road between Watkin Lane and A6 London Way Roundabout. Coded speed reduced from 30mph to 20mph.
- Penwortham Way between south of the junction with Chain House lane to north of Pope Lane.

3.4.3 VM have confirmed that these have been altered to reflect TomTom speed information.

3.5 Familiarity

3.5.1 In line with good practice, familiarity levels have been amended from the default value. These have been set by vehicle type within the South Ribble Base Model. The values used within the model are:

- Car – 70%
- LGV – 40%
- MGV – 20%
- HGV – 10%

3.6 Category and Link Cost Factors

3.6.1 A category cost factor of 0.9 has been applied to the 'Leyland Road' category, which has been used for the links representing the B5254. This has been documented in the LMVR and appears appropriate.

3.6.2 Link cost factors of 1.2 and 0.8 have been used in various locations, these have been documented in the LMVR and generally applied consistently.

3.7 Perturbation

3.7.1 A perturbation level of 5% has been applied to all vehicle types used within the model. This is in line with good practice and is detailed in the LMVR.

3.8 Dynamic Feedback Assignment

3.8.1 Dynamic assignment has been enabled within the model. A feedback interval of 2 minutes, with feedback factor of 0.5 has been adopted within the model. The use of Dynamic Feedback within a network of this size and nature is in line with good practice, as are the values adopted.

3.9 Zone Placement

3.9.1 There are 92 zones in the model, which seems appropriate for a model of this size.

3.9.2 Zone portals are used for the majority of zones, which appears appropriate. All zone portal totals add up to 100%.

3.9.3 Portal 5 for Zone 1 has release links at the double roundabout to the south of the model, some distance from the zone shape is drawn. This looks to have been done in error.

The coding of Zone 1 should be reviewed and altered as appropriate.

4. TIME PERIODS, DEMANDS AND PROFILES

4.1 Time Periods

4.1.1 The model provided has been developed using 13 separate Demand sets which have been assigned to match the times:

- AM1 – 0700-0800
- AM2 – 0800-0900
- AM3 – 0900-1000
- PM1 – 1600-1700
- PM2 – 1700-1800
- PM3 – 1800-1900
- PIJA
- IP1 – 1000-1100
- IP2 – 1100-1200
- IP3 – 1200-1300
- IP4 – 1300-1400
- IP5 – 1400-1500
- IP6 – 1500-1600

4.1.2 It is assumed that the PIJA demand set is related to model development and not relevant for model application.

4.2 Demand Release Profiles

4.2.1 In total, 23 separate release profiles have been developed for each demand set in the model.

4.2.2 IP2, IP3, IP4, IP5, IP6 have an additional 'Profile 1' that has no information associated with it and is not applied to any movements. This can be removed.

4.2.3 The profiles appear to have been applied consistently.

4.3 Matrix Levels

4.3.1 The South Ribble model has been developed using two separate matrix levels

- Matrix 1 – Car and LGV
- Matrix 2 – OGV1 and OGV2

4.3.2 It is assumed that this is suitable for the study area, i.e. no significant and distinct trip patterns exist for vehicle types within each matrix level.

4.3.3 Proportions for each vehicle type within the matrix 1 and 2 demand level have been set which appear appropriate.

5. PUBLIC TRANSPORT

5.1.1 40 public transport services have been coded in the model. These appear to have been coded consistently, with service names matching route names and schedule names.

5.1.2 No checks have been made to compare the coded routes and schedules to the actual routes and schedules.

5.1.3 The bus dwell times for all services have been coded with a minimum of 0s and a maximum of 15s. A dwell time of 0s is possible with these settings and this would be unlikely to happen in reality.

6. NETWORK CODING

6.1 Node and link structure

6.1.1 No overlay was provided so no check was possible between model layout and overlay.

6.1.2 In general, the node and link structure appears to be reasonable.

6.2 Link Visibility

6.2.1 A standard visibility of 30m has been used at give way locations in the model. This has been applied widely in the model as expected and in line with good practice.

6.2.2 Visibility has not been applied at every give way location, but it is assumed that those locations have been left out to match observed behaviour.

6.3 Look Through

6.3.1 The Look Through parameter has been applied at various locations in the model, but has been used relatively sparingly. VM note that it has been applied to links less than 25m that are adjacent to a give way location.

6.4 Priority Junctions

6.4.1 The majority of junctions are coded with what appear to be correct priorities and lane ranges. Exceptions to this have been noted at the following nodes:

- 814 – All movements at this node are coded as major
- 843 – Should be one lane ahead northbound from node 848
- 437 – All movements at this node are coded as major

It is recommended that the priorities at the above locations are modified.

6.5 Signalised Junctions

6.5.1 There are a number of signal controlled junctions and pedestrian crossings coded within the network, which correspond with online mapping checks that were undertaken.

6.5.2 No formal checks were made on the signal control timings adopted within the network provided for review. A spot check showed the staging sequences to appear to have been coded consistently.

6.6 Roundabouts

6.6.1 There are eighteen roundabouts coded in the model using roundabout nodes and a check of the coding has been carried out for each.

6.6.2 At the John Horrocks Way/Golden Way Roundabout the roundabout lanes are coded inconsistently, for example at node 97 there is a conflict between the vehicles heading north. Looking at the lane markings on the ground it appears as though right turning traffic should be in lane 3 only, however the roundabout lanes and next lanes force them to lane 2. This may be to match observed behaviour.

6.6.3 At the Tank Roundabout a, vehicles on approach to the roundabout are making inconsistent lane choices. For example, on link 356:357, all vehicles going to either 358 or 359 have a lane range of 1-2 while satellite images suggest that at this point vehicles going to node 358 should have a lane range of 1-1 and those going to node 359 a lane range of 2-2. Hazard overrides have been used to attempt to address this but they are not having an impact due to the hazards selected for the overrides being incorrect. For example hazard override '349:358,1-2,356:357,1-1' is not having any effect because the signposting for the hazard to which it is attached does not extend back to the roundabout. A viable alternative would be '349:358,1-2,356:357,1-1'. There are similar issues with the other hazard overrides at this location.

6.6.4 At the Croston Road/Flensburg Way/Farringdon Road/Century Road double roundabout some of the behaviours appear to be incorrect. For example, on the approach from node 294, if a vehicle is heading towards node 283 or node 273 it can be in lane 1 or 2 but if it is in lane 2 it will immediately cut across to lane 1 as it passes across node 289. This is due to the interaction between the two roundabouts affecting the lane ranges.

It is recommended that the behaviours are improved at the John Horrocks Way/Golden Way Roundabout, the Tank roundabout, and at Croston Road/Flensburg Way/Farringdon Road/Century Road double roundabout.

6.7 Kerb and Lane Points

6.7.1 In general the match between model and overlay is good and provides representative paths for vehicles at junctions.

6.7.2 There are a small number of locations where match between model and overlay could be improved. The most notable is the roundabout approaches at links 791:778 and 789:776 where the approach angles do not accurately match the overlay which may have an impact on vehicle speeds.

It is recommended that the model layout is reviewed at these locations

6.7.3 It is noted that a large number of lane points have been moved from default as would be expected.

6.8 Hazards

6.8.1 Signposting distances have been changed from default in 21 locations. These appear to have been applied to improve the vehicle lane use at lane drop locations, which is likely to be appropriate.

6.9 Hazard Overrides

6.9.1 There are several hazard overrides some of which appear to have been applied appropriately but, as noted above there are some which are not operating correctly.

A review of the hazard overrides should be carried out to ensure that they work as expected.

6.10 Headway Factors

6.10.1 Headway factors of 0.2, 0.4, 0.6, 1.5, 1.75 and 2 have been used in the model in various locations. These have been documented and explained in the LMVR.

6.11 Give Way to Oncoming Traffic

6.11.1 Give way to oncoming traffic has been applied in 3 locations in the model and has been documented in the LMVR.

6.12 Clear Exit Adherence

6.12.1 Clear Exit Adherence has been applied in 3 locations in the model and has been documented in the LMVR.

6.13 Give Way To All

6.13.1 Give way to all has been applied with 70% adherence on all non-signalised roundabout approaches where there is more than one circulatory lane.

6.14 Speed Restriction Sets

6.14.1 No Speed Restriction Sets have been included in the model.

6.15 Defined Routes

6.15.1 The defined routes that have been used in the model have been applied appropriately.

6.15.2 SYSTRA note that VM state that a routing review has been undertaken following the initial audit, but it appears as if unrealistic route choices still exist in the model that could be removed with defined routes. An example is shown in Figure 2 which shows the Route Viewer for an arbitrary route in the model. The route highlighted in dark blue takes what appears to be an unrealistic route on School Lane/Charnock Moss.

Figure 1. Routing Check example

7. ERRORS WHEN RUNNING MODEL

7.1.1 There are no errors when running the model.

8. CALIBRATION AND VALIDATION

8.1.1 The turn and link count information provided shows a good level of calibration with the model meeting or exceeding WebTAG criteria in all instances. There are locations where individual comparisons between modelled and observed are not as strong but these appear to be generally in lower flow areas or locations towards the periphery of the model.

8.1.2 The routes used for journey time validation appear sensible and the comparisons between modelled and observed are good with TAG guidance being exceeded in all periods. It is recommended that consideration is given to providing an explanation for the discrepancies on individual journey paths where they exist.

9. SUMMARY

9.1.1 SYSTRA have carried out an initial review of the South Ribble Paramics Discovery Model and identified a few issues for VM to address, it is noted that these are unlikely to significantly affect the calibration or validation of the model but it is recommended that changes are made to the model in advance of application

9.1.2 The data in the spreadsheets provided shows a good level of calibration and validation.

Appendix F - Model Forecasting Note

South Ribble Paramics Modelling
Forecast Model Inclusions

VM210430.TN003

Introduction

1. On behalf of Taylor Wimpey, Vectos has developed a micro-simulation model of the South Ribble area that is being used to assist with the assessment of "The Lanes", a residential led development adjacent to the A582 Penwortham Way.

2. The purpose of this note is to provide details on the methodology for including the committed development trips within the Paramics model, and more specifically the creation of the Base + Committed Development scenarios.

Committed Developments

3. The Base + Committed Development forecast model is underpinned by the previously developed 2021 Base model. The Base model has been calibrated and validated in line with WebTAG guidance as documented in the LMVR[1].

4. In order to develop the Forecast model, to be used in the assessment of the development site, Vectos have firstly isolated the committed sites that are considered likely to have impact on the network, based upon the study area under consideration. Vectos have then accounted for the development assumptions for each identified site within the microsimulation model to form the Base + Committed development forecast scenario.

5. The development assumptions related to each committed development site are included explicitly in the model assignment matrices, to ensure all predicted trips likely to interact with the study area are accounted for.

6. Following a review of the development schedule, six committed development sites have been identified for inclusion within the Forecast model, four of which lie within the study area, and two of which lie outside of the model extent.

7. To develop the demand assumptions associated with the committed developments, information such as number of dwellings, employment area and relevant trip rates has been extracted from the South Ribble District Planning Portal.

8. The developments included within the Forecast model are listed in the following table along with key planning application information. The ID numbers in **Table 1** correspond with **Figure 1** which maps out the locations of each site.

[1] VM210430.R002 LMVR

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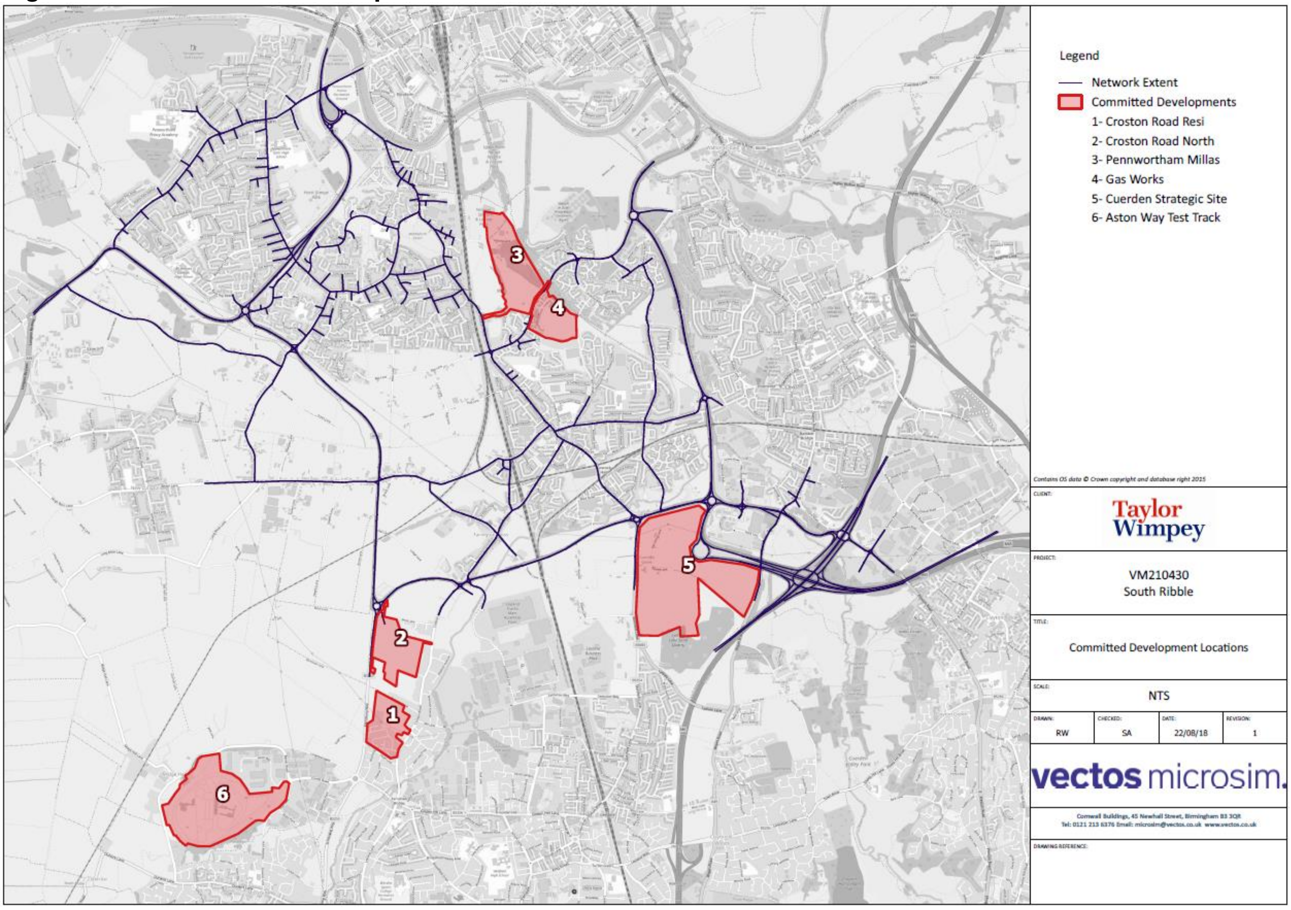
Table 1: Committed Developments

ID	Name	Reference	Dwellings	Employment Space sqm
1	Croston Road Resi	07/2012/0627/ORM	174 (350)	N/A
2	Croston Road North	07/2014/0184/ORM	400	N/A
3	Land at Penwortham Mills	07/2014/0190/ORM	385	N/A
4	Gas Works	07/2015/0315/REM	248 (281)	N/A
5	Cuerden Strategic Site	07/2017/0211/ORM	210	205,600
6	Aston Way Test Track	07/2017/3361/ORM	950	28,000

Figure 1: Committed Development Locations



Trip Generation Assumptions

9. The trip rates for the committed development Sites 1, 2 and 6 were derived using directly from the associated Transport Assessment documents, whereby a TRICS output (a database of trip rates for developments to quantify trip generation) was provided for each site.

10. The TRICS outputs for Sites 3 and 4 were not available within the documents reviewed, however, on the basis that Sites 1 to 4 are all residential sites, of relatively similar sizes with regard to number of

dwellings, the TRICS trip rates derived for the Croston Road residential sites (Sites 1 and 2) have also been applied to the Land at Penwortham Mills and Gas works sites (Sites 3 and 4), respectively.

11. The trip generation for the Aston Way Test Track site (Site 6), which is a mixed land-use development has also been taken directly from the supporting Transport Assessment document. The TRICS outputs within the TA have been provided for both the residential and employment land use at the site.

12. The resultant trip rates applied to Sites 1-4 are demonstrated within **Table 2,** with the trip rates assigned to Site 6 demonstrated in **Table 3:**

Table 2: Trip Rates Applied to Sites 1 - 4

Time	TRICS Trip Rates (Residential)	
	Arrival	Departure
07:00 - 08:00	0.07	0.246
08:00 - 09:00	0.152	0.384
09:00 - 10:00	0.169	0.211
10:00 - 11:00	0.153	0.19
11:00 - 12:00	0.183	0.186
12:00 - 13:00	0.203	0.182
13:00 - 14:00	0.191	0.183
14:00 - 15:00	0.197	0.2
15:00 - 16:00	0.273	0.205
16:00 - 17:00	0.318	0.196
17:00 - 18:00	0.371	0.224
18:00 - 19:00	0.263	0.21

Table 3: Trip Rates Applied to Site 6

Time	TRICS Trip Rates (Residential)		TRICS Trip Rates (Employment)	
	Arrival	Departure	Arrival	Departure
07:00 - 08:00	0.075	0.287	0.352	0.097
08:00 - 09:00	0.14	0.434	0.488	0.286
09:00 - 10:00	0.16	0.194	0.348	0.27
10:00 - 11:00	0.133	0.166	0.298	0.275
11:00 - 12:00	0.152	0.157	0.264	0.282
12:00 - 13:00	0.166	0.163	0.333	0.357
13:00 - 14:00	0.159	0.162	0.356	0.308
14:00 - 15:00	0.169	0.178	0.278	0.273
15:00 - 16:00	0.281	0.195	0.274	0.327
16:00 - 17:00	0.291	0.18	0.294	0.421
17:00 - 18:00	0.385	0.202	0.127	0.421
18:00 - 19:00	0.331	0.222	0.071	0.151

13. Subsequently, the trip generation for each site was calculated by multiplying the number of dwellings, or employment floor area at each site, by the trip rates provided. The resulting outbound and inbound trip generation by site is shown in **Table 5** and **Table 6** respectively.

14. Trip generation for Site 5, the Cuerdon Strategic site, has been accounted for by modelling work previously undertaken for the assessment of the Lanes site. On this basis, the previously assessed AM and PM peak hour trip totals have been applied within this assessment. Although only the AM and PM peak hour totals were provided, Vectos have applied a factoring approach based upon the TRICS

outputs for Sites 1-4 to derive a proxy number of arrivals and departures for the remaining modelled hours. The resultant trips assigned to this site are demonstrated in **Table 4**.

Table 4 Trip Totals for Site 5

Time	Site 5 Arrivals/Departures by Hour	
	Arrival	Departure
07:00 - 08:00	264	221
08:00 - 09:00	648	418
09:00 - 10:00	327	509
10:00 - 11:00	171	149
11:00 - 12:00	190	196
12:00 - 13:00	220	332
13:00 - 14:00	256	297
14:00 - 15:00	175	244
15:00 - 16:00	158	331
16:00 - 17:00	469	1467
17:00 - 18:00	418	653
18:00 - 19:00	125	211

15. The resulting outbound and inbound trip generation by site is shown in **Table 5** and **Table 6** respectively.

Table 5: Hourly Trip Generation by Development - Outbound

Site ID	Hourly Trip Generation - Outbound											
	07:00 - 08:00	08:00 - 09:00	09:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00	16:00 - 17:00	17:00 - 18:00	18:00 - 19:00
1	32	51	28	25	25	24	24	26	27	26	30	28
2	98	154	84	76	74	73	73	80	82	78	90	84
3	110	171	94	85	83	81	71	78	80	76	87	82
4	61	95	52	47	46	45	45	50	51	49	56	52
5	221	418	509	149	196	332	297	244	331	1467	653	742
6	219	360	190	171	167	186	175	179	202	211	226	185

Table 6: Hourly Trip Generation by Development - Inbound

ID	Hourly Trip Generation - Inbound											
	07:00 - 08:00	08:00 - 09:00	09:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00	16:00 - 17:00	17:00 - 18:00	18:00 - 19:00
1	8	18	20	18	22	24	22	23	32	37	44	31
2	28	61	68	61	73	81	76	79	109	127	148	105
3	25	54	60	54	65	72	86	89	124	144	168	119
4	17	38	42	38	45	50	47	49	68	79	92	65
5	264	648	327	171	190	220	256	175	158	469	418	125
6	115	182	169	142	148	170	170	161	232	243	271	226

Trip Distribution Assumptions

18. Trip distributions for each of the committed development sites included within the models have been set up utilising existing base model distributions. Each new zones included within the model,

reflecting the committed developments, has been allocated a distribution from an existing zone based on proximity and zone type.

19. A different approach was adopted for the Cuerdon Stategic site development (Site 5) where the associated trip generation is substantially higher than the other developments. Proxy distributions which had been outlined in the planning application were applied to the trips, ensuring that the high volume of traffic associated with the Cuerdon site was distributed appropriately.

20. For the developments which lie outside of the network, the percentage of trips likely to interact with the network were calculated using census distributions. The Croston Road residential site (Site 1) and Aston Way site (Site 6) developments are located outside of the model network, within MSOA South Ribble 015 and South Ribble 014 respectively. The distributions for each MSOA were extracted using 'Travel to Work' census data. The percentage of inbound and outbound trips interacting with the model network were calculated to range between 68% and 76%. The percentages calculated were applied to the total trip generation to determine the respective model demands.

21. For the trips that do interact with the network, distributions were then allocated based on the external zone by which the trip accessed the network. In both cases, trips interacted with the network via Flensburg Way and therefore, the existing base model distributions for external zone 906 were applied for both development trips.

Demand Summary

22. The original 2021 Base demands are provided in the following **Table 7**. This can be compared to the summary of the demands assigned to the Base + Committed Development scenario, demonstrated in **Table 8**.

Table 7: 2021 Base Model Demands

Matrix	AM			IP						PM		
	0700-0800	0800-0900	0900-1000	1000 - 1100	1100 - 1200	1200 - 1300	1300 - 1400	1400 - 1500	1500 - 1600	1600-1700	1700-1800	1800-1900
1 (Lights)	18996	21593	15716	13698	14887	16298	16273	17868	20284	23601	22752	15305
2 (Heavies)	1761	1841	1673	2117	2269	2053	2163	2232	2172	1597	1667	1543
Total	**20757**	**23434**	**17389**	**15815**	**17156**	**18351**	**18436**	**20100**	**22456**	**25198**	**24419**	**16848**

23. As can be seen from **Table 6** below, trips associated with the committed developments have been added into the model via a discrete assignment matrix (Matrix 3) which remains consistent across all Base + Committed Development model hours.

Table 8: Forecast Model Demands

Matrix	AM			IP						PM		
	0700-0800	0800-0900	0900-1000	1000 - 1100	1100 - 1200	1200 - 1300	1300 - 1400	1400 - 1500	1500 - 1600	1600-1700	1700-1800	1800-1900
1 (Lights)	18996	21593	15716	13698	14887	16298	16273	17868	20284	23601	22752	15305
2 (Heavies)	1761	1841	1673	2117	2269	2053	2163	2232	2172	1597	1667	1543
3 (Com Dev)	1198	2248	1642	1185	1283	1528	1509	1396	1705	3005	2302	1844
Total	21955	25682	19031	16736	18494	19933	19999	21539	24418	28203	26721	18692
Periodic Growth (%)	***8.27%***			***7.66%***						***10.77%***		

24. Following the inclusion of the committed development demands within the Base model, (to form the Forecast Model), a review of the level of growth that inclusion of these sites equates to has been undertaken.

25. By including the committed development sites alone, the level of traffic growth accounted for within the model equates to the following percentages for each modelled period:

- AM Period - 8.27% growth
- Inter Peak Period – 7.66% growth
- PM Period – 10.77% growth

26. A subsequent review of TEMPRO forecast factors suggests that this level of traffic growth exceeds the level of growth predicted to occur up to 2035 on the local traffic network (when TEMPRO is interrogated for the South Ribble district).

27. On the basis that the inclusion of the committed development sites alone exceeded the level of growth predicted up to 2035, it was determined that no further traffic growth would be assigned to the model for the purposes of this assessment.

Committed Development Vehicle Release Profiles

28. The assignment of vehicle release profiles to each of the committed development sites has remained consistent with the method applied within the base model.

29. Within the Base Model, profiles have been derived directly from proximal traffic count data. MSOA boundaries have been used to inform sectoring of the model and a generic profile has been produced based on count data within each profile sector. The profiles are then applied to the zones that fall within each Sector.

30. Accordingly, a profile has been assigned to each committed development site, dependent on which MSOA (sector) it lies within.

Conclusion

31. On behalf of Taylor Wimpey, Vectos has developed a micro-simulation model of the South Ribble area, which is being used to assist with the assessment of The Lanes, a residential led development adjacent to the A582 Penwortham Way.

32. This note has detailed the methodology for including the Committed Development trips within the modelling to form the Base + Committed Development Forecast Models. Upon inclusion of the committed development sites identified within the models, the level of growth accounted for within the Forecast model is around 8.5% in the AM period and 11% in the PM period, when compared to the 2021 Base model.

33. This level of growth is in excess of the TEMPRO predicted growth to occur between 2021 and 2035 within the study area, and on this basis, the inclusion of the committed development sites alone within the model is considered to provide a sufficiently robust model network upon which to base an assessment of “The Lanes” development impact.

Appendix G - Model Network Results Outputs

South Ribble - Results Spreadsheet Overview

VM210430.TN002

Introduction

1. Vectos has been commissioned to undertake and assessment of 'The Lanes' residential development using the recently developed South Ribble Paramics model.

2. The model runs have now all been completed, and the results have been extracted from the relevant scenarios and included within a bespoke results spreadsheet, which has been issued alongside this note.

Purpose of this Note

3. The purpose of this note is to provide an overview of the information that is presented within the accompanying spreadsheet.

Interpretation/Grading

4. At times, within the spreadsheets, grading has been adopted to allow the classification of results based on the relative changes. This is adopted within the Journey Time and Queue Overview tabs whereby a grade is assigned based on the difference observed between scenarios selected by the user.

5. The grading is provided for information purposes only. The scale adopted within the spreadsheets is adjustable and can be changed by the user at any time.

6. Vectos would recommend that if there is an intention to report classification within a Transport Assessment or similar, that the criteria is discussed and agreed separately with the Highway Authority.

7. The remainder of this Note sets out the measures which are presented within the accompanying results spreadsheet.

Number of runs

8. All results are based on the average of 10 runs per time period, per scenario. The following time periods have been reported within the accompanying spreadsheet:

- AM: 07:00 – 10:00
- PM: 16:00 – 19:00

9. Results for the inter-peak period (10:00-16:00) are also available upon request.

Model Scenarios

10. The following scenarios have been reported within the results spreadsheets:

- 2021 Base
- 2021 Base + Committed Development
- 2021 Base + Committed Development + The Lanes Development (1,100 dwellings)
- 2021 Base + Committed Development + The Lanes Development (1,350 dwellings)
- 2021 Base + Committed Development + The Lanes Development (1,350 dwellings) + Partial Mitigaiton
- 2021 Base + Committed Development + The Lanes Development (1,350 dwellings) + Full Mitigation
- 2021 Base + Committed Development + The Lanes Development (2,000 dwellings) + Full Mitigation

11. The Committed Development model contain only permitted development contained within and on the outskirts of the study area.

12. The partial mitigation consists of replacing the A582 Flensburg Way/Croston Road roundabouts with signal controlled cross-road junctions (as per the Full Mitigation scheme drawings).

13. The Full Mitigation consists of the dualling of the A582 between the A582 Golden Way/John Horrocks Way roundabout and A582/Stanifield Lane roundabout.

14. Assessment of the site in these models is intended to provide an indication as to where on the modelled local network the development traffic may have an impact.

Network Statistics

15. This tab provides a high level overview of network performance across all modelled scenarios.

16. Network statistics are based on all of the completed trips within each modelled period, using the Paramics trips-all file which contains details of all completed trips.

17. The presented statistics are based on the average time taken for each trip and the average speed of these trips.

18. Details of the network statistics and how they are calculated are given below:

Network Mean Delay

19. Network Mean Delay gives the average journey time (seconds) it takes for a vehicle to complete its' assigned trip through the model.

20. This is calculated by averaging the journey times of all completed trips in each model run. These results are then averaged across all runs.

Network Mean Speed

21. Network Mean Speed is the average speed (kilometres per hour) of vehicles completing their trip during the modelled period.

22. The average journey length for each run is calculated from the trips-all files by averaging the length of all completed trips. This is then averaged across all runs and then divided by Network Mean Delay in order to give Network Mean Speed.

Total Completed Trips

23. Total Completed Trips (veh) is the number of trips that have completed during the simulation period. The Total Completed Trips (%) is this same number divided by the total model demands assigned during the same period. This statistic provides an indication of the level of trips that remain in the network at the end of the simulation and have therefore not completed their trip.

Journey Time (JT) Overview

24. This tab provides a summary of the average journey time recorded on each of the assessed routes defined within the model. Comparisons of these values across scenarios therefore provides an indication of delay. The breakdown of these routes into the component sections is also provided to allow review of where on the route any additional delay may be being recorded.

25. Two scenarios can be compared across all time periods. The scenarios to be compared can be selected at the top of the tab, using the drop-down menus in the yellow cells.

Data Collection

26. Paramics reports the average time (in seconds) that it takes for vehicles to travel along the length of a route.

27. The average journey time is reported hourly for each route in each model run. These results are then averaged across all runs to provide the results presented in this tab.

28. Routes are often broken up into sections, this is done to allow for localised delay analysis to be conducted. This also helps increase the sample size of trips contributing to the average journey time results, as vehicles must travel the complete length of a section in order to be counted so shorter section increase the likelihood of this.

29. Where routes are broken up into sections the average journey time is calculated for each section. Journey times for the complete route are calculated by summing the journey times for all of the sections that make up this route.

Results

30. The journey time (seconds) for each route is presented for both the selected scenarios, broken down by hour.

31. The % Diff column gives the percentage change in journey time from scenario 1 to scenario 2.

32. The Criteria column gives a grading to routes where there is a notable change in delay between the two scenarios.

33. Four criteria are given as a generic assessment of the change in journey time from scenario 1 to scenario 2:

- Criteria 1 – Journey time has decreased by more than 25%
- Criteria 2 – Journey time has increased by between 25% and 50%
- Criteria 3 – Journey time has increased by between 50% and 100%
- Criteria 4 – Journey time has increased by more than 100%

34. These criteria are only an indicator of where notable changes in delay have occurred and should not be solely used to determine if a change in delay is acceptable or not. Agreement should be sought before any criteria are relied upon.

35. If required the criteria can be changed by altering the percentage values in the grey cells in the below table. The values of -999 and 999 should be kept fixed in order to ensure that extreme changes in delay are accurately categorised.

Journey Time by Route

36. This tab presents the journey time for one route for a selected time period and presents these times for all of the modelled scenarios in a single graph and table. Where a route is bi-directional the times for each direction is presented separately.

37. The route and time period can be selected in the yellow cells. The specific section along the route, or the times for the complete route, can also be selected in the drop down provided.

Data Collection

38. The data collection method mirrors that which is adopted for the Journey time overview tab. The only difference between the two tabs is that the route tab allows for specific comparisons and produces figure based on the selections.

Results

Journey times for each scenario are presented in tabular format with an accompanying histogram.

Queue Overview

39. The queue overview tab presents the average maximum queue length (in vehicle numbers) recorded on all assessed junction approaches in each modelled hour.

40. Two scenarios can be compared across all time periods. The scenarios to be compared can be selected at the top of the tab, using the drop-down menus in the yellow cells.

Data Collection

41. Paramics reports queue lengths based on queue routes that are coded into the model. These queue routes usually are propagated upstream from the assessed approach until another assessed junction in reached. For this reason, the queue lengths can be limited to the distance between the assessed junctions and the outputs may need to be reviewed with this in mind.

42. Queues are measured in number of vehicles and reflects the longest single lane queue (and not the sum across several lanes). The maximum for each hour is reported for each model run, which can occur at any point throughout the hour. The maximum queue for each hour is averaged across all runs to calculate the queue lengths presented in the results spreadsheet. Where approaches contain multiple lanes, the maximum queue length is based on the longest queue observed in any lane and is not the sum of the queues across the multiple lanes.

43. Subsequently, if it transpires that more detailed queue length information is required then VM would recommend that queueing data is assessed based on the 10-minute average maximum queue lengths which can be presented inclusive of confidence intervals to provide a greater level of detail pertaining to the likely length and profiling of the queues across the modelled periods.

Results

44. The average maximum queue length (vehicles) for each approach is presented for the selected scenarios, broken down by hour.

45. The Diff column shows the change in queue length from scenario 1 to scenario 2.

46. The Criteria column gives a grading to routes where there is a substantial change in delay between the two scenarios.

47. Four criteria are given as a generic assessment of the change in queue length from scenario 1 to scenario 2:

- Criteria 1 – Queue Length has decreased by more than 25 vehicles
- Criteria 2 – Queue Length has increased by between 10 and 25 vehicles
- Criteria 3 – Queue Length has increased by between 25 and 50 vehicles
- Criteria 4 – Queue Length has increased by more than 50 vehicles

48. These criteria are only an indicator of where notable changes in queueing have occurred and should not be solely used to determine if a change in queue length is acceptable or not.

49. If required the criteria can be changed by altering the values in the grey cells in the below table, the values of -999999 and 9999999 should be left to ensure that extreme changes in queue length are reported within the correct criteria.

Queues by Junction

50. This tab presents the maximum queue lengths (vehicles) for all approaches to the selected junction across all scenarios for a given time period. The volume arriving via each approach is also provided in a separate graph.

51. The junction and period can be toggled at the top of the tab using the drop-down menu in the yellow cells.

Data Collection

52. The method of queue data collection is consistent with that which is adopted for the collection of queue data presented within the Queue Overview tab.

Results

53. Maximum queue lengths are presented for each approach across all of the scenarios in a data table. These results are also presented as a bar chart to allow for easy comparison between scenarios and for presentation within reports.

Flow and Speed by Link

54. This tab presents the average flow (vehicles) and speed (mph) at a set of defined links across the model network representing notable locations across the network.

55. Results are presented for all scenarios for a given time period and link. The location, time period and data type (flow/speed) can be selected at the top of the worksheet using the drop-down menu within the yellow cells.

56. A figure is included within this tab referencing the location of all the assessed links.

Data Collection

57. Average link flows and speeds for each link are reported by Paramics for each hour of each model run. These results are then averaged across all model runs to provide the results given here.

Results

58. Flow/Speed results are presented for all scenarios. Results are presented for each direction on the link as well as two-way results. Two-way flow is the sum of both directions while two-way speed is the average of both directions.

59. These results are also presented in three histograms, one for each direction and one for the two-way results.

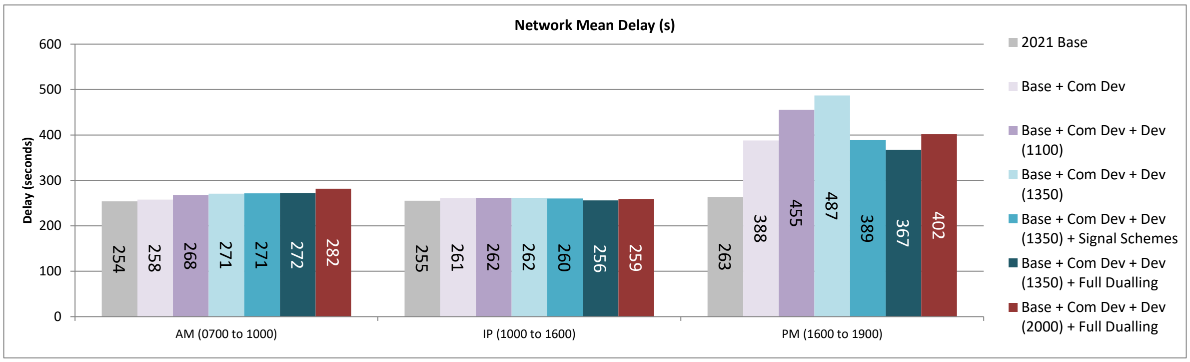
vectos microsim.

Job Title:	South Ribble
Job Number:	VM210430
Model Name:	South Ribble
Model Year:	2021
Date:	August 2021

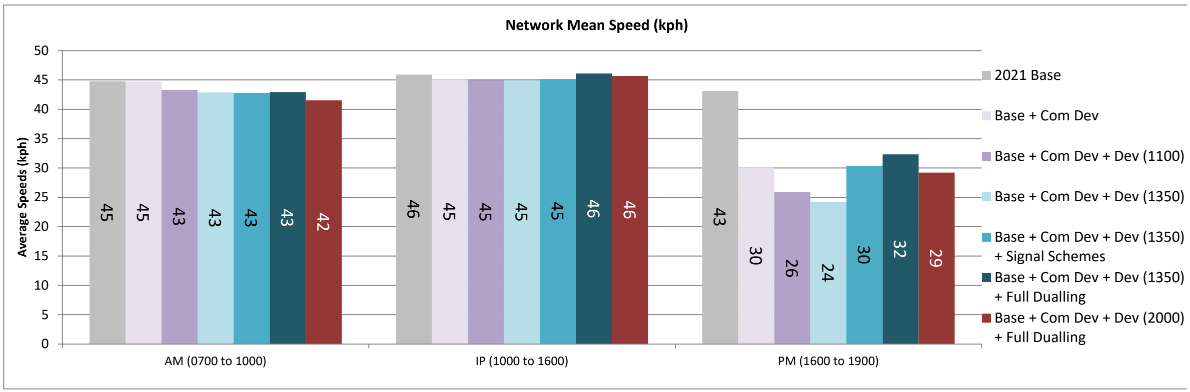
Scenarios:

Scenario 1	2021 Base
Scenario 2	Base + Com Dev
Scenario 3a	Base + Com Dev + Dev (1100)
Scenario 3b	Base + Com Dev + Dev (1350)
Scenario 4	Base + Com Dev + Dev (1350) + Signal Schemes
Scenario 5	Base + Com Dev + Dev (1350) + Full Dualling
Scenario 6	Base + Com Dev + Dev (2000) + Full Dualling

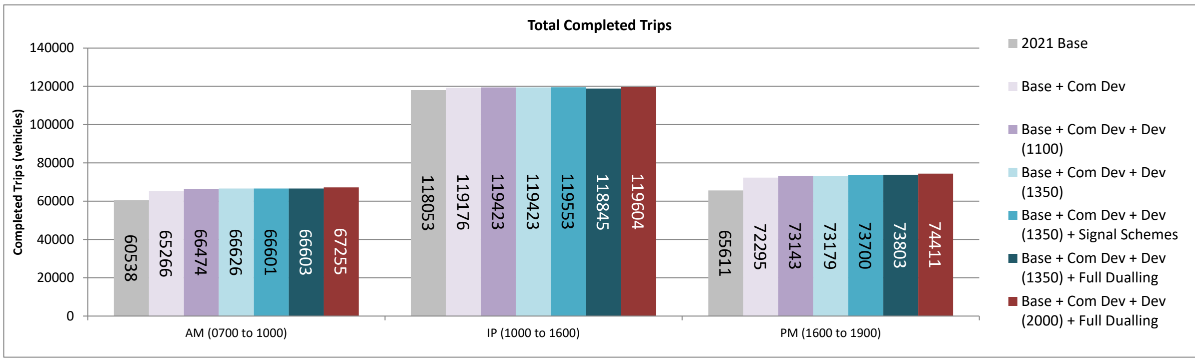
Network Mean Delay (s)	Scenario 1 2021 Base	Scenario 2 Base + Com Dev	Scenario 3 Base + Com Dev + Dev (1100)	Scenario 4 Base + Com Dev + Dev (1350)	Scenario 5 Base + Com Dev + Dev (1350) + Signal Schemes	Scenario 6 Base + Com Dev + Dev (1350) + Full Dualling	Scenario 7 Base + Com Dev + Dev (2000) + Full Dualling
AM (0700 to 1000)	254	258	268	271	271	272	282
IP (1000 to 1600)	255	261	262	262	260	256	259
PM (1600 to 1900)	263	388	455	487	389	367	402



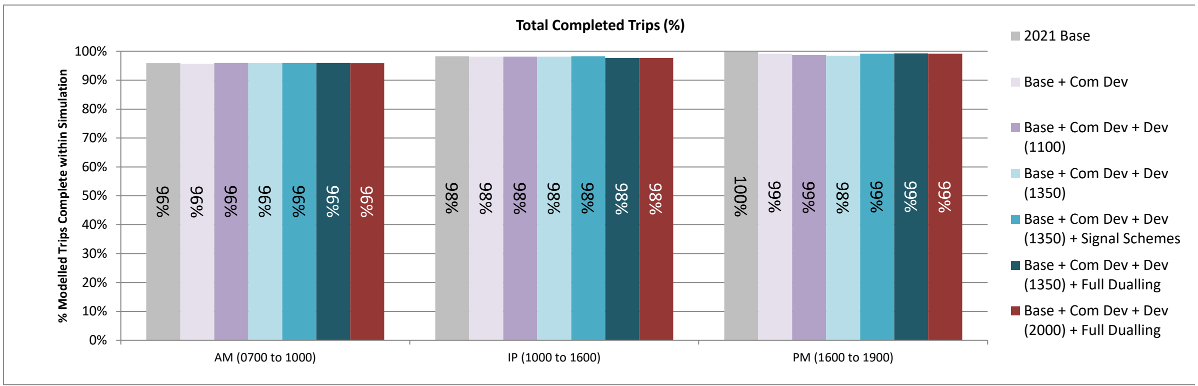
Network Mean Speed (kmph)	Scenario 1 2021 Base	Scenario 2 Base + Com Dev	Scenario 3 Base + Com Dev + Dev (1100)	Scenario 4 Base + Com Dev + Dev (1350)	Scenario 5 Base + Com Dev + Dev (1350) + Signal Schemes	Scenario 6 Base + Com Dev + Dev (1350) + Full Dualling	Scenario 7 Base + Com Dev + Dev (2000) + Full Dualling
AM (0700 to 1000)	45	45	43	43	43	43	42
IP (1000 to 1600)	46	45	45	45	45	46	46
PM (1600 to 1900)	43	30	26	24	30	32	29



	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Total Completed Trips	**2021 Base**	**Base + Com Dev**	**Base + Com Dev + Dev (1100)**	**Base + Com Dev + Dev (1350)**	**Base + Com Dev + Dev (1350) + Signal Schemes**	**Base + Com Dev + Dev (1350) + Full Dualling**	**Base + Com Dev + Dev (2000) + Full Dualling**
AM (0700 to 1000)	60538	65266	66474	66626	66601	66603	67255
IP (1000 to 1600)	118053	119176	119423	119423	119553	118845	119604
PM (1600 to 1900)	65611	72295	73143	73179	73700	73803	74411



	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Total Completed Trips (%)	**2021 Base**	**Base + Com Dev**	**Base + Com Dev + Dev (1100)**	**Base + Com Dev + Dev (1350)**	**Base + Com Dev + Dev (1350) + Signal Schemes**	**Base + Com Dev + Dev (1350) + Full Dualling**	**Base + Com Dev + Dev (2000) + Full Dualling**
AM (0700 to 1000)	96%	96%	96%	96%	96%	96%	96%
IP (1000 to 1600)	98%	98%	98%	98%	98%	98%	98%
PM (1600 to 1900)	100%	99%	99%	98%	99%	99%	99%



Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay	Total Dem	Trip Completion %
2021 Base							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	60537.9	3.158185848	44.77022542	253.9844368	63131.239	95.89%
10	PM	65611	3.155512483	43.14080227	263.3392939	65771.159	99.76%
	IP	110826.4444	3.216733329	47.3790728	244.4205707	112511.77	98.50%
Base + Com Dev							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	65266.1	3.200430723	44.70045942	257.7509223	68220.99281	95.67%
10	PM	72295.2	3.240982532	30.08516598	387.9913016	72904.14289	99.16%
	IP	118053.2222	3.256145838	45.90874056	255.3358521	120114.3364	98.28%
Base + Com Dev + Dev (1100)							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	66473.7	3.219243835	43.31562939	267.572113	69282.37952	95.95%
9	PM	73143.44444	3.275241474	25.90091037	455.3996416	74075.59152	98.74%
	IP	119176	3.263757012	45.05560341	260.7814906	121428.9375	98.14%
Base + Com Dev + Dev (1350)							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	66625.6	3.224703187	42.88946816	270.6997192	69422.00024	95.97%
9	PM	73178.66667	3.277856131	24.26213934	487.0289168	74319.6847	98.46%
	IP	119423.4444	3.265317926	44.94606049	261.5404553	121651.0783	98.17%
Base + Com Dev + Dev (1350) + Signal Schemes							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	66601.3	3.227396917	42.80247583	271.4746392	69422.00024	95.94%
10	PM	73699.7	3.273328914	30.38132943	388.6148624	74319.6847	99.17%
	IP	119553.1111	3.266677243	45.17150371	260.3434936	121651.0783	98.28%
Base + Com Dev + Dev (1350) + Full Dualling							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	66603.3	3.242107733	42.94331538	271.8279052	69422.00024	95.94%
10	PM	73803.2	3.297358019	32.31419657	367.4705507	74319.6847	99.31%
	IP	118844.8889	3.277953059	46.0868552	256.0546939	121651.0783	97.69%
Base + Com Dev + Dev (2000) + Full Dualling							
Runs	Peak Period	Total Vehicles	Average Journey Distance In km	Average Speed Per Vehicle	Average Delay		
10	AM	67255.2	3.250840004	41.52708498	281.855133	70119.02088	95.92%
10	PM	74411.3	3.321548804	29.21354855	401.718956	75027.1259	99.18%
9	IP	119604.3	3.286903284	45.68019958	259.0382827	122480.5615	97.65%

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